1874 Vol. XLVI NOVEMBER 23rd, 1944

FLIGHT

and

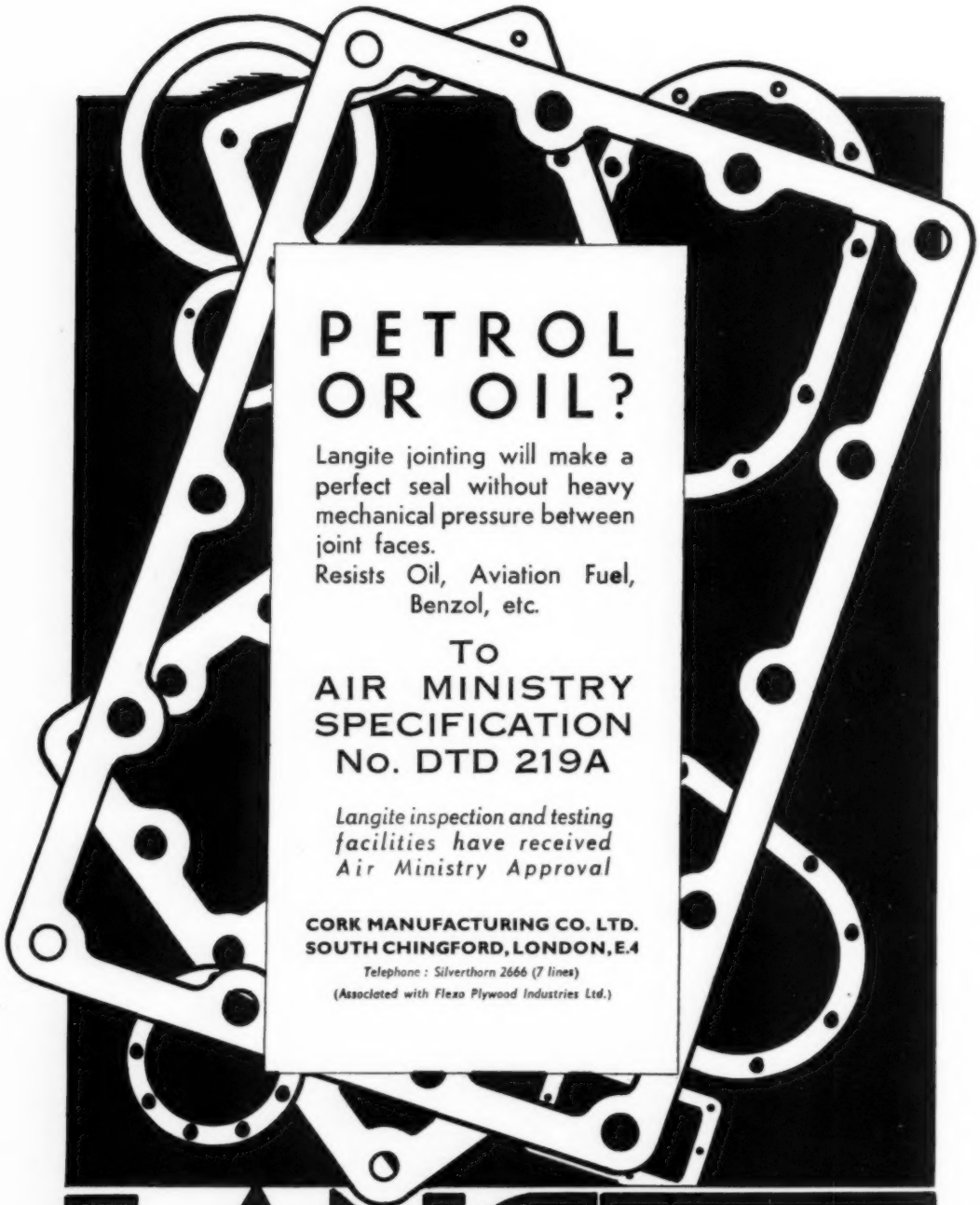
AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING

RETURN TO "E" LIBRARY

The PINNACLE Metal Diaphragm NUT

The SIMMONDS Elastic Stop NUT



PETROL OR OIL?

Langite jointing will make a perfect seal without heavy mechanical pressure between joint faces.
Resists Oil, Aviation Fuel, Benzol, etc.

TO AIR MINISTRY SPECIFICATION No. DTD 219A

Langite inspection and testing facilities have received Air Ministry Approval

CORK MANUFACTURING CO. LTD.
SOUTH CHINGFORD, LONDON, E.4
Telephone : Silverthorn 2666 (7 lines)
(Associated with Flexo Plywood Industries Ltd.)

LANGITE
JOINTING MATERIAL
RESISTS OILS, SPIRITS · PETROL · BENZOL

LANCASTER II

HALIFAX III

STIRLING

BEAUFORT

WELLINGTON

BEAUFIGHTER

ALBEMARLE

SUNDERLAND

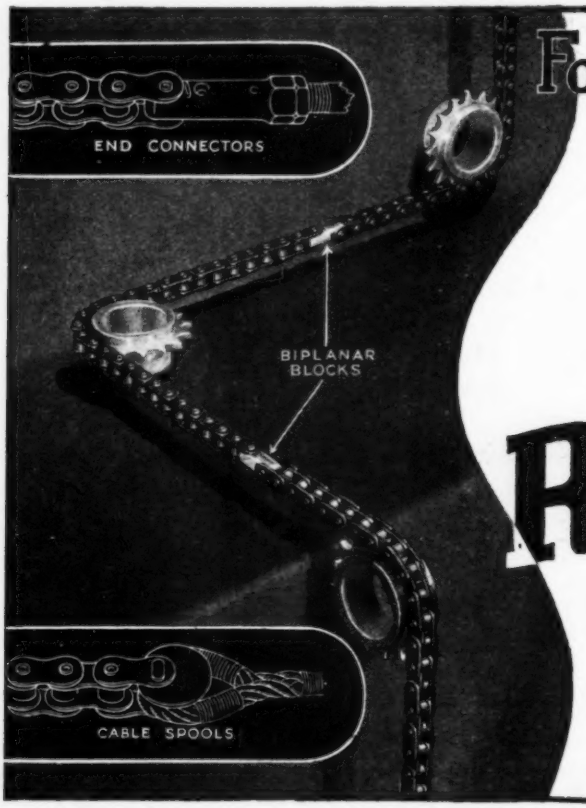
SKUA

. . . a few of Britain's front line aircraft powered by the famous "Bristol" range of sleeve valve engines fitted with

LODGE

plugs—the punch behind Britain's aero engines

LODGE PLUGS, LTD., RUGBY.



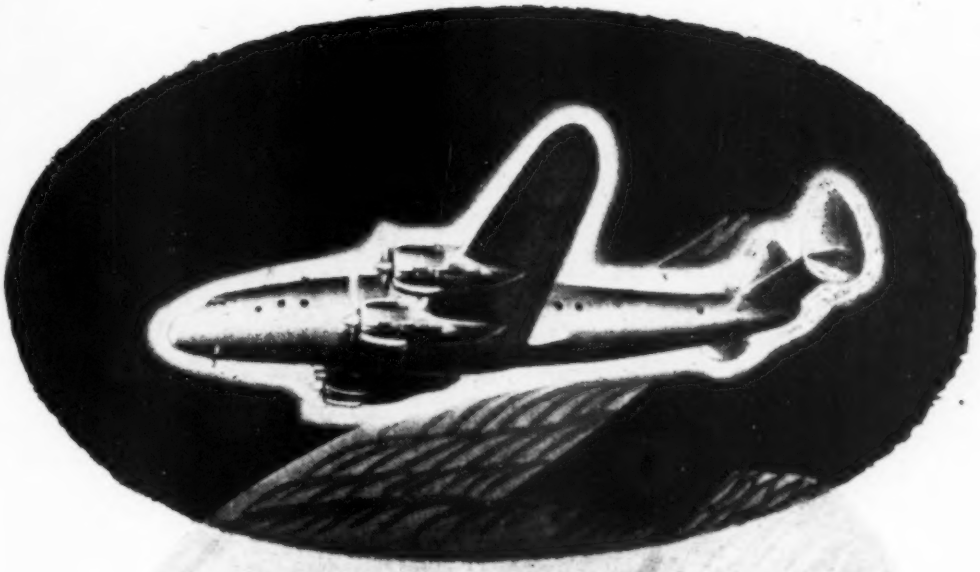
For awkward corners

Maximum adaptability combined with positive operation and light weight, are provided by Renold precision roller chains, which, with standard S.B.A.C. end connectors, cable spools and biplanar blocks, enable awkward angles and clearances to be dealt with in control systems.

RENOLD

CHAINS FOR AIRCRAFT

THE RENOLD AND COVENTRY CHAIN CO. LTD.
MANCHESTER ENGLAND



YEAR BY YEAR, from the first flight at Kitty Hawk, longer, faster, higher flights have marked the pages of history. With them has come a steady increase in dependability which has at last made the airplane the hope of our world.

The ink is hardly dry on the page that tells of the Constellation and the new world standards it has set—longer, faster, higher. Greater payloads. Exceptional versatility. Star performance at *all* ranges—connecting towns or spanning oceans and continents. And with these, other new standards too—for its performance means greater safety and comfort. It has the power for quick take-off and fast climb; range and ceiling to fly around or over the weather; ruggedness to take in stride the duties demanded of an Army transport—or an airliner in the age of flight.

Lockheed's Constellation

highest speed of any transport ★ longest range of any transport ★ largest load-carrying capacity of any transport ★ greatest rate of climb of any transport—AND these performance factors make the Constellation the safest of any transport.

FOR NEW WORLD STANDARDS IN AIR TRANSPORTATION

LOOK TO LOCKHEED FOR LEADERSHIP

Lockheed Aircraft Corporation Burbank, California, U. S. A.

THE FAIREY AVIATION COMPANY LIMITED : HAYES : MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Editor
C. M. POULSEN

War Correspondent
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1874. Vol. XLVI. November 23rd, 1944 Thursdays. One Shilling.

The Outlook

Towards the Setting Sun

AIR CHIEF MARSHAL SIR PHILIP JOUBERT has recently added his influential voice to an outcry from the South-East Asia Command that the 14th Army in Burma is "the Forgotten Army," suffering extreme hardships on an enormously long front without arousing the interest which is its due from the people in the United Kingdom. The Air Force rather than the Army is the concern of *Flight*, but in a land campaign it is impossible to study one Service without paying attention to the other. We can plead that in our issue of October 12th last we published an article on "Air Power in Burma" which at least focused attention on the campaign there.

Before very long the war against Japan may well take pride of place in the columns of British newspapers. In America Japan has always appeared the more interesting enemy, even though President Roosevelt (whom we respectfully beg to congratulate on his election to a fourth term of office) agreed with Mr. Churchill that world strategy demanded that Germany must be knocked out before our full might was diverted to the barbarous nation which still boasts itself to be the Land of the Rising Sun.

An article on the Pacific war theatre appears in this issue.

General Arnold, who commands the U.S. Army Air Forces, remarked the other day that Japanese fighter production was still unchecked, and looked forward to the day when the daily visit of thousands of bombers will make life in Japan as little worth living as it has become in Germany. What part the Royal Air Force will play in bringing about that consummation remains to be seen; but it is certain that British aircraft carriers and the rest of the Royal Navy will be in at that death.

One can apply to the Japanese war lessons learnt from the war with Germany, and General Arnold had something to say about that war, too. Rather surprisingly he stated that the German Air Force to-day probably has more aircraft than ever before, but cannot use them because it has not the crews or the fuel. German shortage of fuel is a well-known fact, and so is the shortage of German man-power; but one would have thought that there would be little difficulty in raising the few thousand pilots needed to man the fighter aircraft if they exist in such numbers. General Arnold has access to information denied to the ordinary observer; but it certainly seemed to the latter that the series of bombing raids on factories where German fighters were produced, which were made just before D-Day, must have been partly responsible for the extreme coyness of those fighters ever since.

Exit the Tirpitz

NEARLY 20 years ago the ex-German battleship *Ostfriesland*, which had been handed over to the United States after the Armistice of 1918, was sunk by a bomber of the U.S. Army Air Forces with a 2,000 lb. bomb which fell as a near miss but so damaged the vessel's plates below the water that she went to the bottom. In our issue of November 9th, we said in a leading article that, paradoxically, "it is better to miss the target than to hit it." On November 12th the *Tirpitz* was sunk by Lancasters of Bomber Command, which attacked with 12,000 lb. bombs.

Twenty-nine Lancasters attacked the ship, and each dropped one of these huge bombs. It is believed that there were three or four direct hits, and many near misses. The most interesting tactical point about the incident is the question whether the battleship was

sunk by the direct hits or by the near misses. Probably the truth will not be known for certain until after the war, when the *Tirpitz* may be floated again, as the German ships at Scapa Flow were floated, and examined.

Wing Commander J. B. Tait, who led one of the waves of Lancasters, said that before this final attack Bomber Command was confident that two or three direct hits would send the ship to the bottom. But what everyone would like to know is whether it was the direct hits or the near misses which actually proved fatal. It was probably impossible to blow the ship up by hitting the magazine, which was not likely to contain anything except rounds for the A.A. guns; and there is no suggestion in the reports that this happened. Almost certainly the ship was sunk by holes below the water line.

Exit the Battleship?

IT is not difficult to imagine the reaction of the German Kriegsmarine to the sinking of the *Tirpitz* by Lancaster bombers. It would, however, be of particular interest to know the reaction of other naval authorities the world over to this latest affront to their domain. The naval mind is very conservative, and it will be a long while before the real significance of the loss of the *Tirpitz* is accepted as a lesson. Nevertheless, it must be realised from now onwards that naval vessels —from capital ships downwards—will sail the seas or float at safe anchorages only by permission of air power, either by virtue of the supremacy of their own country's air power, or by reason of their enemy's air impotence.

With the one vital exception of proper fighter cover, the *Tirpitz* was perfectly sited for defence. Apart from its own A.A. guns it was surrounded by other A.A. guns on the islands and mainland, and doubtless all this artillery was controlled by radar. Around the ship itself were anti-torpedo nets, and the anchorage was chosen not only for its strategic position, but also because it was the farthest possible distance away from our air bases. Yet, as soon as Bomber Command had decided on the means, this super battleship was sunk after three comparatively small raids.

CONTENTS

The Outlook	543
War in the Air	545
Here and There	548
Pacific Struggle	550
Bristol Freighter	555
Civil Aviation Debate	557
Behind the Lines	559
Modern Airscrews—IV	560
Aircraft in Flying Attitudes	563
Q.F. Mosquito	564
Correspondence	565
Service Aviation	566

The advent of air power over the sea has altered naval warfare out of all recognition. If the air strengths of opposing navies are roughy equal, then battle is never joined by the surface vessels. On the other hand, if one side has air supremacy then the only task left for the winning fleet is to finish off lame ducks.

There is, of course, still the argument that a major fleet action may be fought in such bad weather that air power cannot be employed. The answer to that is to be found in the various instruments employed to make flying possible in any weather and in those which enable precision bombing to be done without seeing the target. Accuracy of aim is bound to improve until eventually it will be more accurate than present-day visual bombing. It is not, in fact, difficult to foresee the time when bad weather will be looked upon more as an asset than a handicap. In concerted actions the bombers will drop their loads by instrument through cloud, and torpedo aircraft will use the low visibility to close with their targets.

At Taranto the opposing ships did not fire a shot, but the Italian fleet was crippled by aircraft. The *Bismarck* was slowed down by aircraft and finished off by surface attack. In the Pacific the Americans have dealt a heavy blow at the Japanese fleet, and now the *Tirpitz* lies at the bottom of a Norwegian fiord. The chain of events points to the finish of the battleship—at any rate, in its present form.

QUEEN OF EGYPT: ***Cleopatra,*** **one of the fleet of Short Empire class flying boats belonging to B.O.A.C., refuelling during a halt at Laropi on the White Nile. First in the air in 1940, the long and faithful service given by** ***Cleopatra*** **during a most difficult period is a remarkable tribute to both the builders and the operators.**

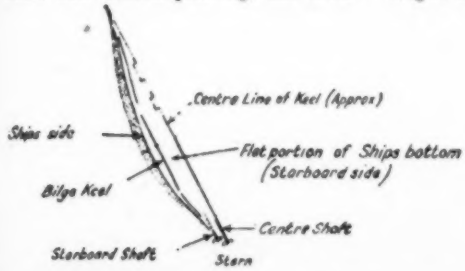
WAR in the AIR

Sinking the "Tirpitz": Weather and Aircraft in Holland: Air Activity in Italy, Balkans and Norway

ON HOME GROUND: A Mitchell squadron of the Royal Dutch Naval Air Service operating with 2nd T.A.F. on the Continent.

BOMBER COMMAND has scored its most spectacular aggressive success (and that Command is essentially an aggressive one) by sinking the battleship *Tirpitz* with 12,000 lb. bombs. Opinions have always been divided as to whether bombs would sink a battleship, and many authorities held that the only weapon at the disposal of an Air Force which would do so was the torpedo. Earlier in the war the battleship H.M.S. *Rodney* was hit fair and square on her armoured deck by a German bomb, which killed and wounded some officers and ratings, but did no harm at all to the ship. But the production of the 12,000 lb. bomb, both blast and armour-piercing, has introduced a new element into air warfare which seems to upset many of our earlier theories.

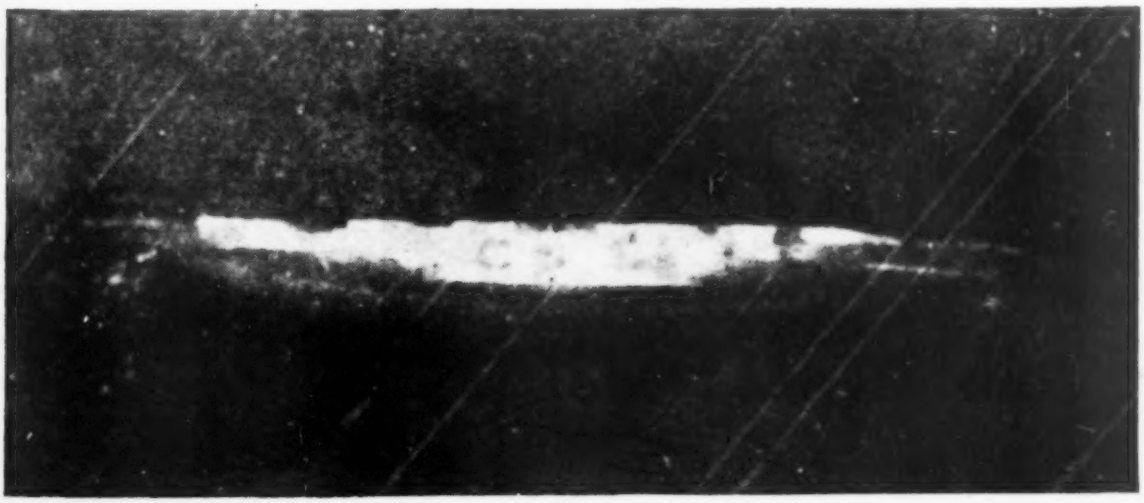
At one time naval authorities held that a warship when moving and firing her A.A. guns, and perhaps also protected by fighters, would be most difficult to hit with a bomb from the air. On the other hand, some said, a moored hulk with empty magazines might be easier to hit, but would be harder to sink. British losses of battle-cruisers, from H.M.S. *Queen Mary* at Jutland to the *Hood* in the hunt of the *Bismarck*, had been sunk through the explosion of their own magazines by shells. H.M.S. *Prince of Wales* and *Repulse* were sunk by numerous torpedo hits, and the torpedo has always been acknowledged to be a menace. Now a very modern battleship has been sunk at her moorings by bombs. It is as yet too early to draw conclusive lessons from the event; but it may safely be assumed that the absence of fighter cover was an important factor.



SHOWING ITS HEELS: The 45,000-ton German battleship *Tirpitz* capsized after the attack by Bomber Command Lancasters with 12,000 lb. bombs. The anti-torpedo nets and anchorage defences were of no avail.

In the Low Countries

THE British public has been allowed to learn from its newspapers that there has been snow in the Straits of Dover, and also in the Lake District.



WAR IN THE AIR

It is therefore not surprising to be told that there has been some in the Low Countries as well. It and rain between them cut down the amount of air support by the Tactical Air Force as the British soldiers pushed forward over the desolate landscape towards Venlo. One of the correspondents of *The Times* says that they hardly needed it; which is rather a cryptic remark. The *Luftwaffe*, at any rate, did not worry them. The Americans fighting round Metz certainly seem to have missed the usual air reconnaissance on which modern troops so much rely. For some time they were in ignorance of whether the Germans had begun a withdrawal from the area round that fortress, because no aircraft could fly over the gap and see. Some of the forts round Metz were certainly abandoned by the enemy without a fight.

The Germans have announced that several air fleets have been assembled behind Metz, ready to take part in the greater attack which the enemy expects. The Germans certainly did not find that out by air reconnaissance. It may have been guess work, or they may have had reports from sympathising civilians who moved out of the area.

Bad weather does not now have much of a restraining effect on our night-bombers. Attacks on oil plants in the Ruhr have been made nearly every night, and there have been few nights lately on which Mosquitoes have not flown to Berlin and dropped some 4,000 lb. bombs there. London and Southern England, having endured much worse ordeals in the past, are now less upset than ever by the few air torpedoes and rocket bombs which sometimes arrive. Of course, there are individual tragedies and damage; but the Germans cannot seriously believe that they are going to win the war that way, or even to extract easier terms for themselves.

The Provisional French Government has confiscated the property of the Renault Company, which used to work for the Germans. M. Louis Renault died last October, and so could not be brought to trial. The plant will now work for France.

SUPPLY LINE: A Dakota drops ammunition for the Chinese army in an area where the ground is too rough for landing.

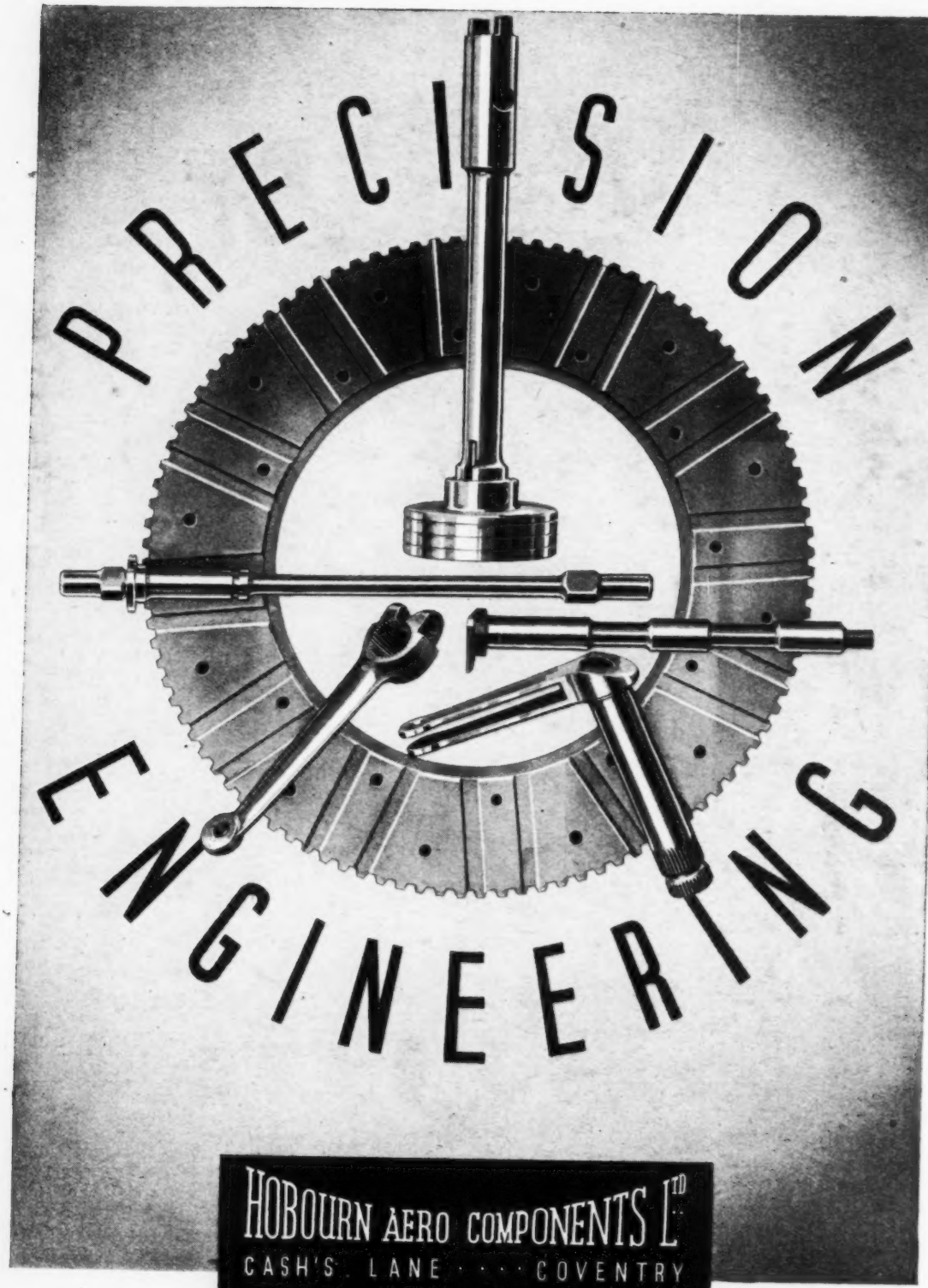
OPEN-AIR BRIEFING: Flt. Lt. N. Thomas gives a target to W/O. James and Flt. Lt. Necklen on a 2nd T.A.F. station. Headgear is scarcely of regulation pattern.

The Great Attack

BY the middle of last week six Allied Armies in the West were attacking the German defences on a front of 600 miles. The latest Army to be mentioned on this front is the American 9th Army, which was last heard of in Brittany, where it captured Brest and cleaned up generally. Its attack in Holland began on November 15th, and was preceded by a terrific air bombardment. There was also air preparation in front of General Hodges' 1st U.S. Army when it started its new offensive from Aachen. First, General Spaatz sent 1,200 Fortresses and Liberators with an escort of 450 fighters to bomb the German lines. No German fighters were met, and only meagre *flak*. Fragmentation bombs were chiefly used, which, like shrapnel shell (of which one seldom hears nowadays) are essentially man-killers. The same day, in the afternoon, Bomber Command despatched over 1,150 machines with an escort of more than 250 Spitfires and Mustangs, to the same front. This bombing was controlled by "master bombers"—a term which had not

Cheetah Engines
are operating for 1,200 hours between overhauls—a flying distance of 150,000 miles, equivalent to six times round the world.

ARMSTRONG SIDDELEY MOTORS LTD., COVENTRY, ENGLAND. BRANCH OF HAWKER SIDDELEY AIRCRAFT CO., LTD.


PRECISION
ENGINEERING
HOBOURN AERO COMPONENTS LTD
CASH'S LANE · · · · COVENTRY
SPECIALISTS IN THE MANUFACTURE OF
COMPLETE ASSEMBLIES & COMPONENTS

WAR IN THE AIR

previously been used in official reports. It seems that the master bomber does duty as a Pathfinder, and also controls the various groups of bombers.

It will be noticed that operations by daylight are now quite an ordinary event for Bomber Command; and that this organisation is becoming quite used to acting as tactical heavy artillery before an advance by an Army. It should also be noted that lately there have been many reports about the doings of the U.S. 19th Tactical Air Force. In the early stages of the invasion the 9th Air Force was the only American body of that nature included in the A.E.A.F.

The Balkan Air Force has been busy in Albania, and its Beaufighters have attacked the palace near Tirana of the ex-King Zog. It would naturally have been confiscated by the Germans for their own use, and it is to be hoped that some of their important officers were in it on November 15th when the Beaufighters loosed their rockets at the building. No fewer than 32 of the missiles went through the roof, and the palace collapsed in flames. In any case it was extremely unlikely that Zog would ever have occupied it again.

In another part of the Balkans a Group of heavy and medium bombers lent to the Balkan Air Force has recently dropped 300 tons of food and equipment to the forces of Marshal Tito.

Elsewhere, units of the 1st Tactical Air Force in Italy have been attacking targets in the Po Valley and in the sector round Bologna. In Norway the escort carrier, H.M.S. *Pursuer*, has sent Wildcats to shoot up armed trawlers off Norway. The *Luftwaffe* seems to be entirely absent from Norway.

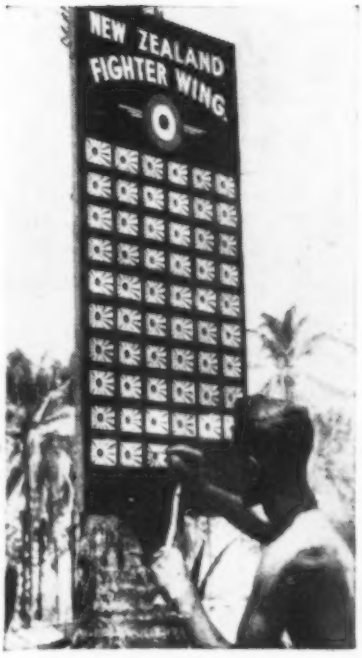
Week-end news includes the welcome tidings that the great battle in the West was blessed with two days of fine weather, which brought out the Tactical Air Forces in full strength and vigour. In front of the American 9th Army the 29th T.A.F. attacked the whole transport system of the Germans between the Rhine and the battle front. Bridges, railways and roads all came in for its attentions. The U.S. tank formations raced ahead before the enemy had time to recover from the shock of the bombing, and our Allies met with only light resistance.

The Germans are fighting against odds in both men and material. They show no signs of intending to pull out from their present positions; but they have to face the almost certainty that they will soon be driven back. Then they will have to decide whether to stand with the Rhine behind them (a most uncomfortable position for outnumbered troops) or cross the river and leave it for the Allies to follow as best they can. The latter move would doubtless be wisest from a military point of view, but the loss of prestige would be immense.

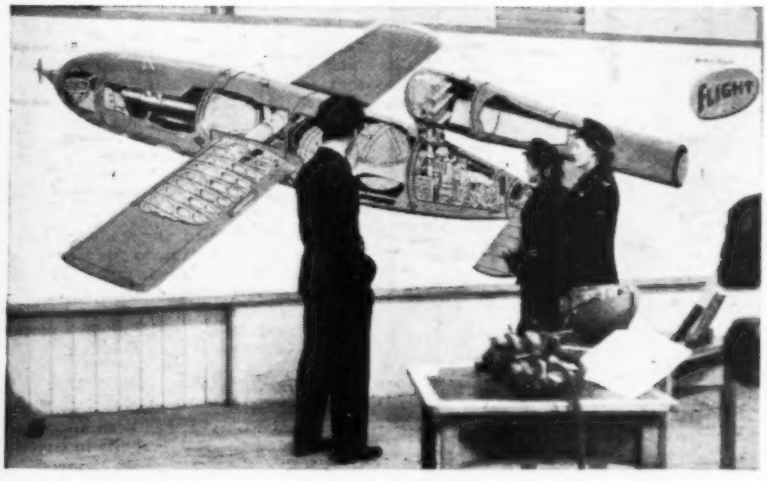
Japanese Battleship Hit

HEAVY bombers with a fighter escort have made a spirited attack on the naval base at Brunei Bay in North Borneo. In the harbour they found a Japanese battleship and a heavy cruiser. The former was hit by five bombs and the latter by four. Fires and explosions occurred in each. There was intense A.A. fire, which brought down three of the bombers, but the Jananese fighters which attempted to interfere were driven off by the Allied escort.

Rocket-firing Typhoons made their first appearance in the S.W. Pacific on Friday last, when they wrecked a building in Portuguese Timor, which was believed to house an enemy garrison. It looked a very solid building, but the rockets speedily demolished it. It had not been attacked before because bombers had not been able to get at it, and it looked too solid to succumb to ordinary methods of air attack.



FALLEN SUNS MOUNT UP: The scoreboard of a New Zealand fighter wing at New Georgia.



IN A GOOD CAUSE: A large coloured reproduction of Max Millar's drawing of the flying bomb which appeared in *Flight* enables the visitor to see where the various components on show are fitted.

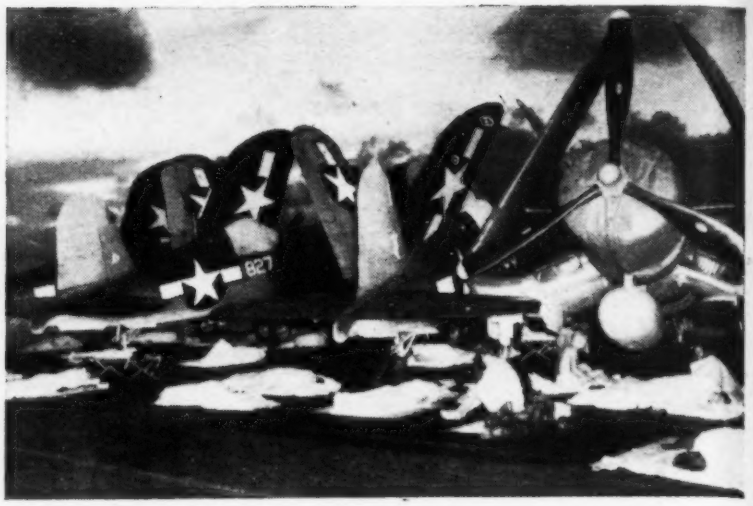
V.1 HELPS N.F.S.

A FLYING bomb exhibition of unusual interest is now open to the public in the basement of Messrs. Stagg and Russell, Leicester Square. The unusual thing about it is that in addition to displaying the now more or less familiar externals of the German V.1 weapon, it also displays the various items of its internal equipment such as the automatic pilot, the servo-control units and so forth, and it is claimed by the sponsors of the exhibition that this is the first time these highly ingenious bits and pieces have been shown to the general public.

The exhibition is being staged by the National Fire Service, and the 6d. charged for admission goes to the very excellent N.F.S. Benevolent Fund.

The advent of the flying bomb in "Southern England, including the London area," greatly increased the work (and the perils) of the N.F.S., so it is by way of poetic justice that one of these devilish contrivances should now be put to work to help the N.F.S. Benevolent Fund.

HERE AND THERE



DOWN IN THE FOREST: This is simply a snap of some U.S. Marines sleeping under the shelter of parked Corsairs on the flight deck of a carrier. But the reader can while away an odd moment sorting out the forest of folded wings.

U.S. Honour for "H.P."

SIR FREDERICK HANDLEY PAGE has been elected an Honorary Fellow of the Institute of Aeronautical Sciences of America, the highest award the Institute can bestow on a "foreigner."

He is the sixth Briton to be thus honoured.

Sir Trafford Leigh-Mallory

THERE is still no definite news, as we go to press, of Sir Trafford and Lady Leigh-Mallory, whose aircraft failed to arrive at its destination after leaving this country on Nov. 14th.

The Air Chief Marshal, formerly in command of A.E.A.F., was on his way to take up his new post of Air C.-in-C. South-East Asia Command.

Death of Sir Charles Craven

THE death was announced last week-end of Commander Sir Charles W. Craven, Bt., O.B.E., R.N. (retired), who was industrial adviser to the Minister of Production, and chairman and managing director of Vickers-Armstrongs, Ltd.

Sir Charles, who joined the Navy in 1898, became a submarine specialist and during the present war served first with the Admiralty. But in April, 1940, he was transferred to the Air Ministry, serving first on the Air Council and later as controller at M.A.P. until he resigned for health reasons in June, 1942, in which year he received his baronetcy. He accepted the post he held till his death, in January 1943.

"Jersey's" London Office

JERSEY AIRWAYS, LTD., announce that they have now opened London offices at Coastal Chambers, 172, Buckingham Palace Road, Victoria, S.W.1.

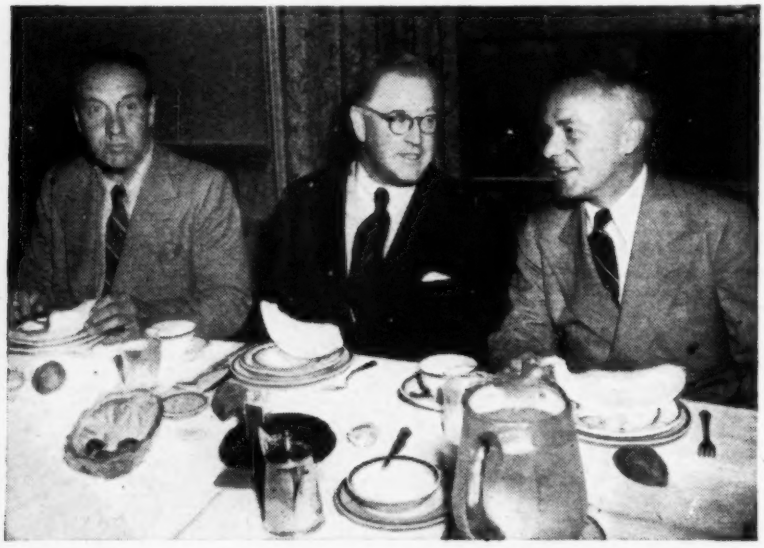
Enthusiastic Modellers

THE recently formed London Area Council of the Society of Model Aeronautical Engineers held its dinner-dance and prizegiving last week-end in the Lysbeth Hall, Soho Square. The function was very well attended. Two ardent modellers who travelled all the way from Bradford for the occasion, and two members of the U.S. Army were among the guests.

The Middlesex Flying Club

SPONSORED by members of "X" Sector, London District, Home Guard, the Middlesex Flying Club has recently issued a leaflet setting forth the salient features about itself.

When it can get going after the war it aims to make its chosen site at Denham something more than just another flying club; it is to be a complete country club with swimming pool, tennis courts, putting greens, and so forth.



BRITONS ABROAD: (From left to right) Mr. G. Woods Humphery, Mr. H. Scott Paine, and Mr. Paul Bewsher (B.O.A.C.'s New York manager) who were among a number of Britons included in the 130 people at the Wings Club luncheon on September 6th last, addressed by Mr. Geoffrey Smith, managing editor of *Flight* and *Aircraft Production*.

Bust of Amy Johnson

A BUST of Amy Johnson—a striking piece of work just completed by Mr. Siegfried Charoux—was exhibited at a private pre-view last week at the Women's Engineering Society in Regent Street, London, of which the famous airwoman was president.

Lady Sinclair, Sir Stafford and Lady Cripps, Lord Brabazon, and Mr. and Mrs. Johnson (Amy's parents) were present, and Mr. Johnson drew attention to the fact that the Mosquito which recently set up a new England-India record was the first aircraft to break the ten-year-old record set up by "Amy and Jim" during the England-Australia race, and was virtually a development of their DH Comet.

An appeal is now being made for donations towards the £12,000 Amy Johnson Memorial Scholarship founded by the Women's Engineering Society in co-operation with the R.Ae.S., to provide professional flying training for young women in post-war civil aviation.

Grecian R.A.F. Command

AIR COMDRE. GEOFFREY WILLIAM TUTTLE has been appointed to command the R.A.F. units in Greece, it was recently reported by Reuter.

A native of Lowestoft, he is 38 years of age and one of the youngest officers to hold the rank of air commodore. He directed the air protection for the Allied

HERE AND THERE

convoys during the invasion of Southern France.

Canucks Fly to India

A LARGE fleet of Dakotas recently carried the complete personnel of a Canadian transport squadron from Britain to India by air in four days.

The Dakotas flew unescorted over France, stopping in Sardinia, Tripoli, Egypt and Iraq.

This will be the first R.C.A.F. transport squadron to operate from India, most of the crew being from R.C.A.F. Transport and Coastal Command squadrons in Canada.

Cheap Substitutes

AN article on the flying bomb recently published in the Soviet newspaper *Red Star*, describes this type of weapon as a "cheap substitute" for regular bombing raids.

Three flying bombs, it was recently revealed, were brought to Britain for examination in a U.S. transport aircraft of the Air Service Command, after being captured intact during the Allied advance across France.

Pilots' Training Competition

THE Portuguese Department of Civil Aviation has recently announced a competition for Portuguese pilots who wish to come to Britain for "intensive training" in civil aviation offered by B.O.A.C. Other successful candidates will go to Spain.

Military pilots with no immediate flying duties are eligible for the competition, and Col. Humberto Delgado, chief of the department, expects to visit Britain in the near future to make final arrangements.

Boeing's Biggest

THE military transport prototype of a double-decked civil airliner, the Boeing 377 Strato-cruiser, is now undergoing its test flights at Seattle.

Mr. C. L. Egdvert, Boeing's chairman, recently said that the Strato-cruiser will have an operating range of 3,500 miles permitting non-stop flights between New York and London. Its top speed, with four engines each of more than 3,000 h.p. will be 400 m.p.h., and it will have an operating cruising speed of 340 m.p.h.

THE FIRST STEP towards "peace-time" air travel in Britain is symbolised by these passengers embarking in the D.H.86 which reopened the London-Liverpool service last week. It is a tribute to the makers that this pre-war wood and fabric biplane is still capable of good service.

Three versions of the Boeing 377 are mentioned; a day passenger transport to seat 100 persons, a luxury sleeper with 36 berths, or an all-cargo transport.

Where it Hurts Most

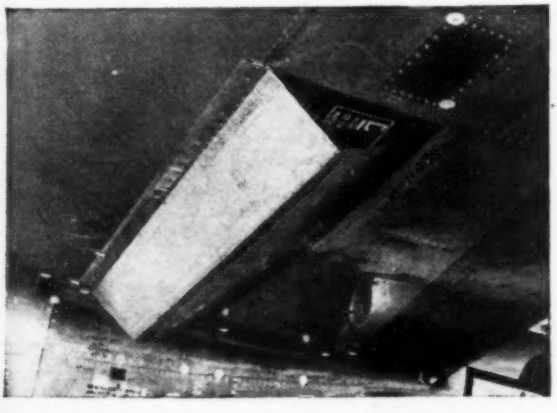
"THE principle on which our targets in Germany are selected is that of destroying, as quickly as possible, Germany's power to wage war."

This was Capt. Balfour's written reply to Mr. Purbrick (Con., Walton), who asked him if he would now arrange to bomb Dresden, Breslau, Magdeburg, and other large centres of civilian population in Germany not already heavily bombed, in retaliation for Germany's deliberate attacks on civilians in England, and with the object of destroying German civilian morale.

Extravagant Overestimates

POINTING out that the total number of aircraft operating on all the civil airlines throughout the world in 1939 was approximately 1,800, and that Imperial Airways and British Airways (afterwards combined in B.O.A.C.) only had about 82 machines between them, Mr. L. Murray Stewart, underwriter and manager of the Aviation and General Insurance Co., recently expressed the opinion that "extravagant overestimates had been made of the number of aircraft likely to be required after the war for civil airlines."

He thought that the opening of new routes would tend to the use of more aircraft, but pointed out that increased speed and carrying capacity meant that fewer aircraft could do the same amount of work as before the war, and he disagreed with those who "talked glibly in terms of thousands of machines."



GOING DOWN NOW, SIR: The neat dive-brake now fitted to the Lockheed Lightning has an articulated action. This shows it half lowered.

U.S. Aircraft Strike

ALL five of the Wright aircraft engine plants in New Jersey are reported to have been "paralysed" by a strike of 1,900 supervisory workers which was the cause of 32,000 workers being rendered idle.

Last week the War Labour Board summoned the strike leaders to Washington to explain their action, and though it was at first thought they would ignore the summons, they decided to obey it after a meeting with Government officials.

Soviet Appreciation

AIR VICE-MARSHAL W. F. DICKSON, commanding the Desert Air Force, and three other members of the R.A.F., were recently presented with Soviet awards in Rome by Gen. Ivan Susuloparov, the Russian representative of the Allied Commission there.

A. V-M. Dickson, who was associated with the Russian Mission in London, received the Order of Suvarov; Group Capt. C. P. Green, commanding a Desert Air Force Wing, received the Order of the Patriotic War; Sgt. Ronald Jephson, of Nottingham, received the Order of Valour; and Cpl. Harold E. Smale, of Tavistock, received the Order of Military Merit. These two N.C.O.s parachuted into Yugoslavia in June of last year as part of the British Mission with the Yugoslav partisans.

With each of these awards goes a free pass to all Russian railway, bus and tramway systems, and vouchers entitling them to small monthly grants from any Soviet embassy.

D

Pacific Struggle

A Story of the Development of the Far East Conflict : Rise of the Aircraft Carrier and Carrier Aircraft

By B. J. HURREN

THE Spanish have a proverb to the effect that a fire at home has more interest than an earthquake in China. The fact that on the Western Front our bombers have created several very gratifying fires may have masked the importance of the dramatic events which have taken place—and are even now shaping—in the Far East.

To appreciate this absorbingly interesting situation it is necessary to realise the immense distances involved. America has few supply bases on its West Coast; and from San Francisco, the major port, it is 7,500 miles to Sydney, 9,134 miles to Rabaul; 5,500 miles direct to Tokyo and 6,331 miles via Pearl Harbour to Tokyo. From Tokyo to Midway Island (which is several hundred miles west of Pearl Harbour) is 2,545 miles. From Rabaul to Tokyo, 2,870 miles, and from Truk it is 2,100 miles.

These figures seem astronomical. But perhaps a more graphic appreciation of them can be gained if one realises that for America to mount an invasion force against Tokyo, Japan, would be roughly equivalent to Britain mounting an invasion force against Bombay, India.

The essential feature of aviation is its power to annihilate distance and time. A ship might make at the most 2½ round trips to Australia from America in a year. Aircraft can make the single journey in eight days. This is a major factor in the war operations, for to break down the time and distance element in the Pacific it was essential to build large numbers of transport aircraft. Those who inveigh against America for building transport aircraft under the military banner are lacking in a geo-strategical appreciation of the scope of the war. There is no excuse for Britain not having also built transport aircraft on a big scale; there is every reason to see the American viewpoint in their transport aircraft programme.

Hours and Months

The diagrammatic map illustrating this article deserves study. It interprets the basic problems facing the Allied staffs in a campaign in the Pacific. It is essential to realise from the map the dominating influence of the air in reducing its dimensions to hours of travel against months.

The next point is enemy strategy. One may assume that the Japs were closely advised of British and American naval and air strength. How, then, could they expect to gain victory against the combined Anglo-American air fleets and sea squadrons? The answer is that the Japanese strategy was based on land operations.

Japan calculated that her line of least resistance was a powerful land thrust, supported and maintained by sea and air power. Without sea cover the Pacific islands could not be reached, and therefore quite logically Japan was forced to embark on a sea attack against the Allied mainspring of power.

The opening move was then the attack on Pearl Harbour. This is the U.S. key base in the mid-Pacific. In a devastating onslaught, specifically designed to cripple and possibly wipe out a threat to the left of the main land drive south, Japanese air squadrons raided Pearl Harbour. In that air blow on December 7th, 1941, five out of eight battleships were knocked out, and three hit but not badly. Other warships, including cruisers and destroyers, were damaged. Of the 202 Navy aircraft ready for use that morning only 52 were able to take the air after the raid. Some 2,117 officers and men of the Navy and Marines were killed and 960 missing. The Japs lost 60 aircraft.

The first great blow using air power against warships since the actions at Taranto and Matapan had been struck. The U.S. naval threat to the left flank of the Japanese was killed for the time being. To secure the right flank, Japanese air squadrons attacked the British warships *Prince of Wales* and *Renown*—and with their lamentable sinking three days after Pearl Harbour the whole pre-war picture had been rearranged at the enemy's will.

You will observe that in order to wage a *land* campaign, Japan mounted a *sea* attack in which she used *air* power as the striking force.

Land, Sea and Air

It may be well to remind readers that Britain laid the foundations of the Japanese Fleet Air Arm. A brief review of the Anglo-American naval air arm position is also necessary. The carrier strength of the American Navy on December 7th, 1941, was seven first-line vessels and one escort carrier merchant ship. The British Navy mustered, in 1939, fewer than 10 aircraft carriers all told, and of those *Ark Royal* was the only modern ship. At the time of Pearl Harbour, *Courageous* and *Glorious* had been sunk and *Illustrious* and *Formidable* badly damaged in the Mediterranean.

The only possible strategy in these circumstances was to allow the Japs to overrun themselves with expansion. The U.S. Navy had to put up a big bluff, and this act was staged on April 18th, 1942, when air squadrons from the carrier *Hornet* raided Tokyo, whilst aircraft from the *Enterprise* provided search and fighter cover. This was the first time in naval history that medium land-bombers were transported thousands of miles across the ocean and launched to attack enemy shores. Chief effect of the raid was to raise morale, and secondly to lure Japan into a trap.

The Japanese land campaign swept south through the Philippines and Celebes to New Guinea. There it paused to gather strength, presumably for an attack on Australia or New Zealand. But the first check to expansion was given in the battle of the Coral Sea. On May 6th, 1942,

PACIFIC STRUGGLE

enemy forces had sufficiently consolidated in the area of the Bismarck Archipelago and New Guinea. On May 7th the naval aircraft of both sides secured successes: The Japanese carrier *Shoho* was sunk by aircraft from the *Lexington* and *Yorktown*.

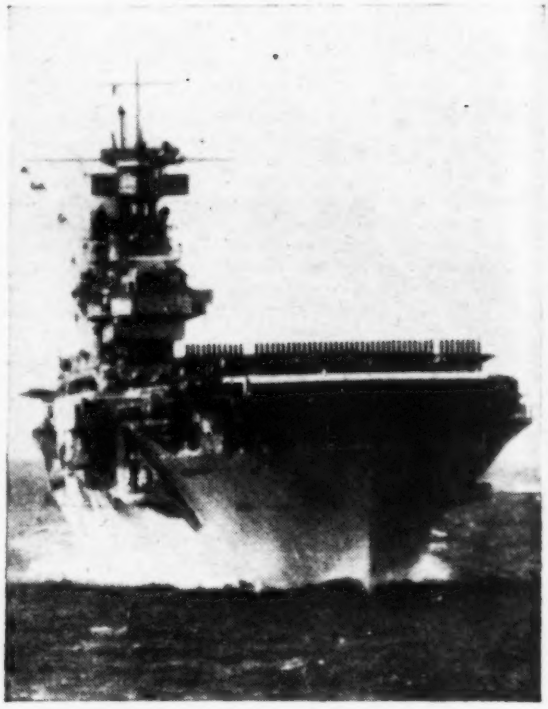
Contact was made on May 8th with two enemy carriers, four heavy cruisers and several destroyers. Air attacks were staged by both sides and, after a considerable amount of mixed fighting, much damage had been inflicted on enemy warships, and large numbers of aircraft shot down. Against this the Americans lost the carrier *Lexington*, one tanker, one destroyer and 66 aircraft. In the official words: "Thus ended the first major engagement in naval history in which surface ships did not exchange a single shot."

The Ships That Matter

This, of course, is not strictly true—at Taranto the opposing ships did not exchange a single shot, and the Italian Fleet was crippled by Swordfish torpedo-bombers alone. But the Coral Sea action effectively halted Japanese expansion to the south. The Japanese realised that the blow at Pearl Harbour had not been sufficient—*they had there knocked out battleships but not aircraft carriers*. They therefore, quite logically, had a second blow to their east, or left, flank. They prepared the attack on the U.S. base at Midway Island.

The U.S. staff must be complimented for their reading of the mind of the Japanese staff. Remembering the vast distances involved, and that a false move would play entirely into Japan's hands, yet the Americans courageously and brilliantly withdrew major sea units from the South Pacific. The *Yorktown*, damaged in the Coral Sea, was patched up. Total naval forces assembled in the Central Pacific, on Midway, with carrier aircraft patrolling the western approaches, were the carriers *Enterprise*, *Hornet* and *Yorktown*, seven heavy cruisers, 14 destroyers and 20 submarines. Even this puny force was split into two task forces, but Army bombers were at Hawaii.

The Japanese move had been anticipated. On June 3rd, only a month after the Coral Sea action, large enemy forces were sighted several hundred miles west of Midway. Again a furious air onslaught was waged on both sides; at least four Japanese carriers were sunk, several battleships, cruisers and destroyers were sunk or left ablaze and presumably doomed, or very badly damaged. Once again the warships did not join battle. Midway was an air action exclusively.

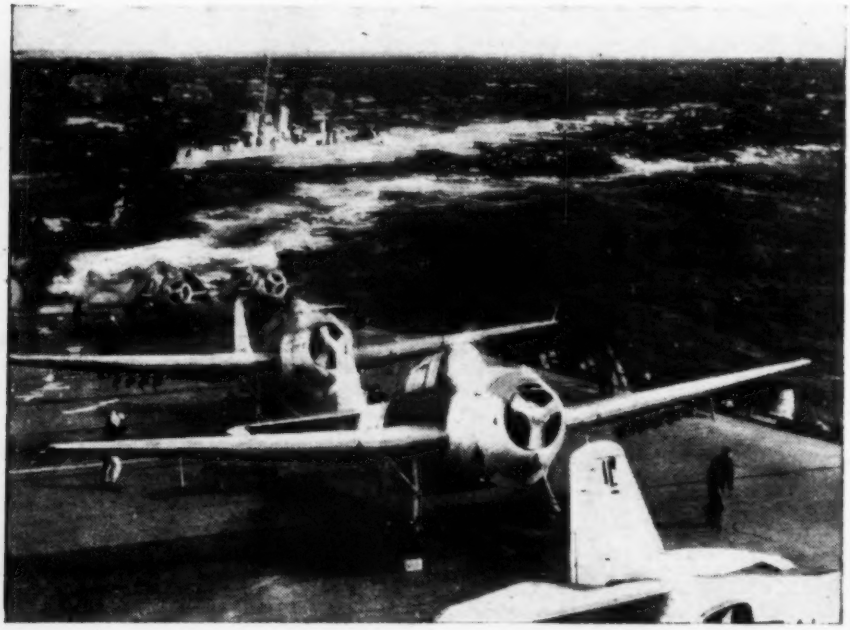


The U.S. Navy aircraft carrier *Yorktown* which was built to accommodate 76 aircraft. Length 762ft., beam 83ft., speed 34 knots. A sister ship to the *Enterprise*.

Frustrated in the south and east, the Japs then switched north. They attacked in the fog-ridden Aleutians, where the inclement weather gave them freedom from air attack. It was not until after midsummer, 1943, that the Japanese were beaten in the Aleutians, though their effective line of advance had been checked long before then.

The shape of the war made a vivid impression on American naval thought. The defence of the Pacific had been gained with a handful of carriers. Attack in the Pacific could be mounted by scores of carriers. Thus, with their admirable enthusiasm and drive (not to mention realistic thinking at the expense of die-hards), by the present time the Americans have introduced more than 100 aircraft carriers.

Although the British had a long lead in carriers, and had pioneered many of the accepted practices in flying technique, British carrier strength to-day stands at around one-half that of the American.



Rocket carrying Avenger torpedo - bombers of the U.S. Navy Third Fleet running - up their engines before take-off.

PACIFIC STRUGGLE

The air power equivalent of 150 carriers amounts to an aggregate of 3,000 aircraft. This tremendous force could be concentrated in the air against any Japanese island possession with every possibility of overwhelming air superiority. By no possible means could any such mass air force be mounted land-based to defend, say, Truk. Antagonists of the aircraft carrier should try to solve this problem from land bases, bearing in mind the surprise which could be achieved with effective air reconnaissance screen from the carrier force itself.

The Philippines

This, then, was the situation at the end of October, 1944. The Japanese at sea had made three attempts to break through the long-distance encirclement, and on each occasion they had failed. In the interim, the great strength in production of the Allies had been marshalled, and the Americans were spoiling for a counter-attack.

A glance at the map will show the commanding position of the Philippine Islands. The U.S. carrier forces made feint attacks; they went to Truk, a great naval Japanese base, and caught it napping, with the Japanese fleet far away. They raided the Bonin Islands, then Formosa, and then struck for their main objective.

The chosen island in the Philippine group was Leyte. This is 675 miles from the Palau group and 1,380 miles from Guam Island. The first landings were made on October 20th, 1944, and it seems not improbable that the Japanese either had reconnaissance reports of the American approach to the Philippines or else had correctly interpreted the feint raids mentioned above. At any rate, whilst the U.S. forces were piling ashore, the Japanese Navy was rushing to intervene in this key action. Like all major sea engagements, many of the facts are obscured by the fog of war, but the broad picture has now emerged.

First heard of in action against the Japanese at Rabaul, the Curtiss SB 2C-1 (Helldiver) is the latest U.S. Navy dive bomber.

The islands of the Philippines where the big air/sea battles were fought in October.

Jap Order of Battle

Japan appears to have divided her forces into three fleets, or she may have had three fleets dispersed and attempting to concentrate. One large force, which for descriptive purposes I may term Force A, came down from Japanese home waters towards Luzon, the large island at the north of the Philippine group on which is Manila.

A second force, Force B, came from the west towards Leyte, threading its way through the Mindoro Strait, then through the Sibuyan Sea, obviously heading for Leyte itself.

A third force, Force C, in the south, approached Leyte through the Mindano Sea, Mindano Island being the southern extremity of the Philippines group.

The critical days of sea battle were October 23rd-24th, and though for convenience the fate of the three fleets, A, B and C, is described separately, in the actual event much of the action was simultaneous. Against the Japanese concentration of warships, the American 3rd Fleet was in the north, off Luzon. The American 7th Fleet was east of Leyte, with supporting forces behind, approaching from several bases.

Japanese Force A comprised one large and three escort carriers; two obsolete battleships, the *Ise* and *Hyuga*; one heavy and four light cruisers, and six destroyers. A dawn air attack was launched against this force, and in conditions of complete surprise the big carrier and two smaller carriers were sunk outright, as well as a cruiser and destroyer. A cruiser and a destroyer were badly damaged. The next night a U.S. submarine sank the cruiser, and another cruiser and the remaining carrier were sunk by naval guns. Both the battleships were hit by bombs, and all the remaining cruisers and destroyers damaged by bombs and naval guns.

The point about this section of the action was that Japanese land-based

PACIFIC STRUGGLE

air squadrons at Luzon did not interrupt the decisive action of the carrier-based aircraft, which were well within range of the land.

Force B consisted of the *Yamato* and *Musashi* (two new battleships), the modernised *Nagato*, and two old battleships of the *Kongo* class, plus one light and seven heavy cruisers, with 13 destroyers but *no aircraft carriers*. There were, however, land aircraft in close support, and no fewer than 150 of these were shot down as they tried to defend the Japanese fleet.

Against Force B the American aircraft achieved great success. Torpedo aircraft sank one light cruiser immediately, severely damaged and probably sank one battleship and one cruiser which may well have sunk later, and badly damaged three other battleships and three more cruisers. Despite these heavy losses, the Japanese fleet continued towards Leyte during the night, passing through the San Bernardino Strait and on towards Samar. This force was attacked by carrier aircraft. Two American carriers were sunk, but every Japanese ship was badly damaged, one cruiser being sunk and one destroyer disabled. It then turned back on its tracks, and during pursuit by cruisers during the night a further straggling cruiser was sunk.

Annihilation

Force C, from the south-west, comprised the battleships *Fuso* and *Yamashiro*, two heavy and two light cruisers, and about eight destroyers, but *no aircraft carriers*. Bombers and fighters attacked this force, which was hit by bombs and rockets, and heavily machine-gunned. It continued on its course and was met, during the night, by warships of the American 7th Fleet. One—perhaps both—of the battleships was sunk, and several cruisers and destroyers, against an American loss of motor-torpedo-boats and a damaged destroyer. The battered fleet turned back on its tracks, and air attacks from the carriers succeeded in sinking the entire surviving party.

The results of this great sea action may be summarised for ready assessment. Twenty-four Japanese ships were sunk, consisting of two battleships, four carriers, six heavy cruisers, three light cruisers, three large destroyers, six standard destroyers. Severely damaged and possibly sunk were 13 ships, consisting of one battleship, three heavy cruisers, two light cruisers, seven destroyers. Damaged beyond assessment but not sunk were 21 ships, consisting of six battleships, four heavy cruisers, one light cruiser, and 10 destroyers. Grand total: 58 ships sunk or damaged.

Against this, American losses were three aircraft carriers sunk, two destroyers, and a few minor craft lost.

This has rightly been acclaimed as a resounding naval victory, but even the most prejudiced would agree that the gilt of the gingerbread is the magnificent work of the carrier aircraft. The duty of naval attack-aircraft is to Find—Fix—and Strike, and without question they did all three superbly.

That is a brief résumé of the greatest naval action of this war, so far; and, though it cannot be said by any means that Japanese sea power has been broken, it does appear that the way to victory in the Far East can rest on the ability of carrier-borne air fleets to fulfil their destiny. And this the naval die-hards find to be the stumbling block. The arguments are soundly based for those who deem caution the essence of successful operational planning.

What would have been the verdict in this Philippines action had the aircraft not been able to fly? Suppose fog, rain, typhoon had descended on October 23rd and negatived the whole long-range attack power of the American forces. The Japanese would have concentrated a simply staggering fleet, which might easily have been like a cat among pigeons had it got loose among the obviously considerable numbers of carriers in the American fleet.

It must, subject to the verdict of history when all the details are disclosed, seem that the Americans played a high card in the knowledge that it might easily be trumped. Japanese apologists declare that the American success in the Midway action was due to an unprecedented extent of blue sky far to the west of Midway, over its approaches, and that only later in the action did the weather deteriorate and allow their ships to move off. The argument, therefore, is that, although aircraft carrier fleets have come increasingly into prominence as the main striking force of a fleet, it is still essential to maintain battleships, cruisers and destroyers to protect the carriers in bad weather, when their aircraft are "winged."

Future Speculation

On this subject widely divergent opinions exist. Developments in radiolocation, the flying bomb and the rocket might easily change the whole conception of air war and sea war once again. This applies not only to the attack power of the aircraft but to the defence power of the ships.

At present the balance of success stands heavily in favour of the aircraft carrier, of which the Allies have an overwhelmingly preponderance numerically. It may be noted that the Americans have announced the building of three super-carriers of 45,000 tons—approximately twice the tonnage of the famous *Ark Royal* and *Illustrious* class vessels here.

Whilst it is always dangerous to predict war operations, it seems that the American-announced intention of driving for the Chinese mainland could be effected once the Philippines are mastered—as they will be now that the carriers have secured the bridgehead at Leyte. This then would (a) directly cut the supply arteries to some million Japanese soldiers south of the Philippines, and (b) possibly open the door to a gigantic pincer movement to close up with the Burmese forces and cut off Siam and Malaya.

But whatever aggressive action the Allies take, the Japanese must win one of their major war objectives. Japanese propaganda has long played up the fact of a surplus population in Japan (approximately 70,000,000 people in 147,559 square miles in Japan proper, compared with 50,000,000 people in 100,000 square miles in Great Britain and Eire), and has stated this to be a fair reason for expansion, by war or otherwise. At least Japan has, by war, disposed of considerable numbers of this crowded population, and few of these will ever see home again. However, only a handful of carriers could, with telling effect, be given the many years' duty of clearing up Japanese-occupied islands long after the main war with Japan has ended. And a brief calculation shows that with some 15,000 large and small islands in the Pacific, and at a mopping-up rate of only three islands per diem, it would take some 15 years to fulfil this mission. I don't think the war will be over by this Christmas!

MIND MY BIKE!

A BICYCLE with a bombing trip to its credit is in the possession of Flt. Sgt. "Charley" Lamond, a Royal Australian Air Force gunner serving with a Mitchell squadron in R.A.F. 2nd T.A.F. To show that it is no ordinary bike, Lamond has painted a bomb on it.

This is how it happened. One day, while operating from an advanced airfield on the Continent, his squadron was ordered to carry out an operation and then land away from their base.

Knowing from experience the transport problems on airfields where the billets, mess and flight offices may be miles from each other, Lamond decided to take his bicycle with him. He stored it in the commodious waist of his Mitchell. After bombing the enemy the Mitchell landed at the other airfield—and the bicycle came in very handy.

Lamond won the Military Medal while serving with the 6th Australian Division in the Western Desert in January, 1941. With one gun he and his comrades repulsed an Italian tank attack and knocked out several tanks. He was one of the first Australians to be decorated. He also served through the siege of Tobruk. On his return to Australia in November, 1942, he transferred to the Air Force.

The Bristol Freighter

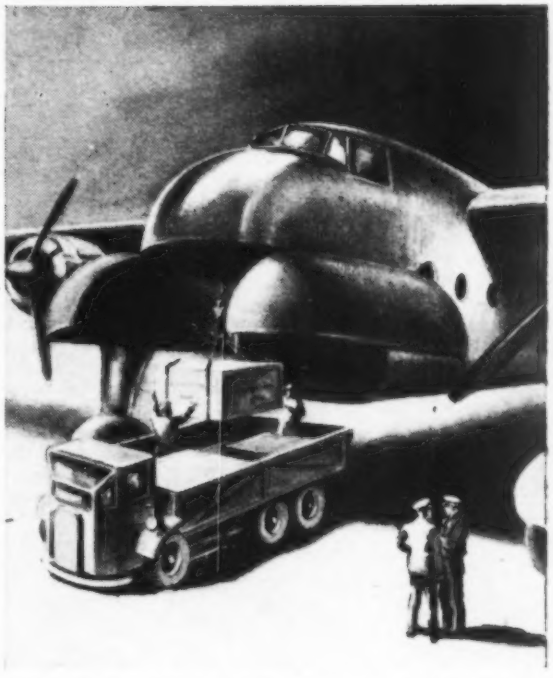
Pay Load 9,000lb. for 300 Miles' Range : Operating Cost One Shilling per Ton-Mile

OPINIONS appear very divided on the subject of air freight. Optimists foresee "all the world's goods carried by air." Others argue that air carriage will always be much more expensive than surface transport. Consciously or unconsciously, the latter probably base their opinion on the physical fact that an aircraft is always, so far as power expenditure is concerned, climbing a hill with a slope of anything from 1 in 10 upwards (the lift-drag ratio of the machine). Probably the truth is, as in so many other spheres, somewhere between the two extremes. Major Thornton, in his recent talk to the Royal Aeronautical Society, foresaw the European mail-order house delivering goods wanted daily and wanted fresh in many parts of Europe; not because aircraft could compete in cost but because it could deliver perishable goods fresh within a few hours.

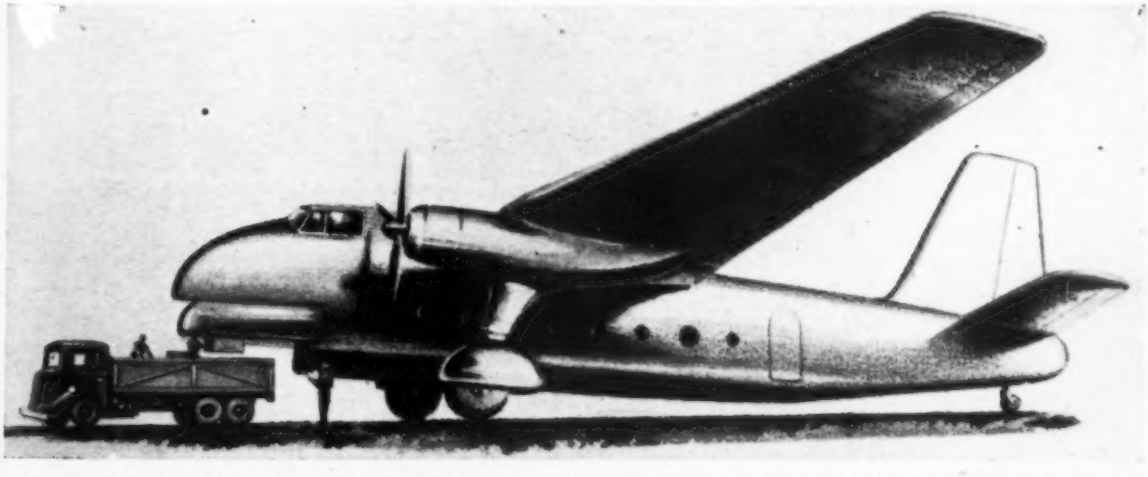
That there must be a great number of places in the world for which flying would provide the only practicable means of transport will scarcely be denied. Guinea Airways proved that many years ago at the Bulolo gold fields in New Guinea. In Latin America Mr. Lowell Yerex, a New Zealander, began work after the first world war with a heterogeneous collection of aircraft, and last year sold a controlling interest in his company, T.A.C.A., to the American T.W.A. for a nice fat sum. He built up his flourishing business very largely by air transport to otherwise inaccessible places. In Canada, too, air transport to the far north has revolutionised travel and has been instrumental in developing regions that would otherwise have remained undeveloped. So there is evidence that air freight *can* serve a very useful purpose.

Evidently the Bristol Aeroplane Co., Ltd., has come to the conclusion that freight aircraft will be needed after the war, for it has "staked its claim," so to speak, by announcing a new freighter designed for low operating cost and easy maintenance. The prototype is planned to fly next summer and production aircraft will follow by the end of 1945. With an initial gross weight of 27,500 lb. the new Bristol Freighter will have a disposable load of 10,000 lb. Obviously this can be divided into any desired ratio of pay load to range. For a range of 300 miles, which is perhaps about the shortest likely to be in demand, the actual pay load is 9,000 lb. At the other end of the scale (i.e., when almost the whole disposable load is in the form of fuel and oil) we have a maximum still-air range of 1,400 miles. It has been estimated that if the machine is used on a job in which the load factor and intensity of utilisation are reasonable, the actual running cost should reach the surprisingly low figure of 1s. per ton-mile.

To get such operational economy, some sacrifice in other directions must obviously be made. In this case it takes the form of relatively low cruising speed, or put in another way, low cruising horse power required. Fortunately



With the nose opened, a standard lorry can back in underneath the hoist to be loaded or unloaded.



Despite its utilitarian purpose the Bristol Freighter will have modern outlines. The undercarriage is of the fixed, cantilever type, carefully streamlined.

THE BRISTOL FREIGHTER

it will rarely be necessary to use high speeds for a freighter. In Western Europe, for instance, it will generally suffice if any place can be reached from this country in the working day, or overnight. For the more distant parts of Europe, and for places as far away as North Africa, air freight will rarely need to make the journey in much less than the 24 hours. Taking these considerations as a basis, the Bristol engineers have designed the Freighter for a cruising speed of some 120-150 m.p.h. It was found that the company already has a most suitable power plant in the Bristol Perseus of about 1,000 b.h.p. At the gross weight of 27,500 lb. two of these engines give a power loading of about 14 lb./h.p., a figure sufficiently low to give good fuel economy, yet high enough to satisfy take-off considerations. The Perseus is a very simple nine-cylinder radial air-cooled engine, the sleeve valves of which need no attention during the periods between overhauls, so that engine maintenance costs should be remarkably low. A similar but more powerful engine is being developed with which take-off requirements can be met at an increased gross weight (30,500 lb.) and correspondingly greater pay load. It is expected that the machine with the more powerful engines will be available in 1946.

The Airframe

As for the airframe itself, the Freighter is of simple construction, and components which require maintenance have been kept to a minimum. The essential ones have been so planned and located that they are readily accessible, so that servicing them is as straightforward as possible. Bristol service engineers at R.A.F. stations have now had some five years' experience of intensive operation, and they may be assumed to have found out which items need the most attention, and to have discovered the best ways to facilitate maintenance. All this accumulated experience is being built into the Bristol Freighter.

In general design the machine is a high-wing monoplane with fixed undercarriage and the two Perseus engines placed on the wing in the orthodox manner. The location of the wing on top of the fuselage is somewhat unexpected in a freighter with fixed undercarriage. The low-wing arrangement would be expected to have two advantages: a shortening of the undercarriage, with resulting drag reduction; and a lower structure weight, due to the fact that the wing spars form two very useful floor members, just at the point where heavy concentrated loads are likely to be placed, viz., near the centre of pressure.

Many years ago, Guinea Airways to which we have already referred, used Junkers G.31 three-engined monoplanes with Bristol Jupiter engines for their haul of heavy mining machinery, and an enormous loading hatch in the roof enabled even very bulky pieces of machinery to be lowered by a crane straight down on to the floor, which rested partly on the wing spars. In the Bristol Freighter a hoist is built into the machine itself, so that the crane on the airfield is unnecessary, or at least needed for exceptionally heavy objects only. The doors hinge outwards, exposing a large opening in the underside of the fuselage nose, while the fixed upper portion serves as support for the hoist. If the object lifted were a very heavy one it would, presumably, be necessary to tie the tail down to a screw picket so as to prevent the machine tilting on its nose.

Freight Hold

In the fuselage a very large freight hold enables the machine to carry maximum pay load, even of goods running to the extreme of 350 cu. ft. to the ton. The hold has a capacity of about 1,700 cu. ft., with a floor space of 210 sq. ft. Fixing points are provided to prevent the cargo shifting during flight in bumpy weather.

The use of a fixed undercarriage appears well justified in a cargo aircraft. The penalty paid is the extra drag, which will lower the cruising speed a few miles per hour for the same throttle opening, or will call for a little more throttle if it is desired to maintain the same cruising speed. At 120-150 m.p.h. this is not likely to be a serious item, and the fixed undercarriage gives several compensating advantages, such as lower weight and cost, great reliability, and negligible maintenance. The fixed undercarriage also makes readily possible the conversion of the machine into a floatplane, a version which may well be very acceptable to operators in certain parts of the world.

With running costs down to 1s. a mile, the Bristol Freighter should find a large market purely on its merits, but there are other considerations which will tend to encourage its sale abroad. The company points out that although it is usually assumed that the United Nations will buy their post-war flying equipment from the United States, few of them have any dollar balance with which to buy. Great Britain, on the other hand, will as a result of the war be indebted to many of the countries which were her debtors in 1939. They have accumulated large sterling balances, and the only practicable way for Britain to liquidate these is by export. This fact is, of course, of advantage not only to the Bristol firm but to the British aircraft industry generally, or at least that part of it which intends to build civil aircraft after the war.

U.S. RIGHTS IN FOREIGN AIR BASES

AMERICA is now setting up machinery by which her lend-lease help to other countries can be used as a lever to obtain the use of air bases in those countries in post-war international air transport.

This is frankly disclosed in an article by Gerard B. Dobben in the Oct. 1st issue of our contemporary, *American Aviation*. Senator James Mead, a member of the aviation sub-committee of the Senate Commerce Committee, is reported in this article to have told the Senate that the President had signed a directive requiring the Foreign Economic Administration to obtain complete information regarding air bases built abroad under War Department supervision, and to take over the responsibility of protecting America's interest in them after they are no longer necessary for military use.

Senator Mead, who is considered likely to be the sub-committee's next chairman in succession to Senator Bennett C. Clark, indicated that the F.E.A., working in close co-operation with the State Department, was being given this responsibility because "in the case of lend-lease countries our rights can be well protected."

"Thus it appears," comments *American Aviation*, "that this government will use lend-lease as one of its principal bargaining media in obtaining rights to use these foreign bases in international air transport in the post-war era. Obviously it would appear from such an arrangement that this country might hold those foreign nations who refuse to give us certain rights in commercial aviation to the strict terms of the lend-lease agreements as far as repayment is concerned."

Senator Mead is also reported as having described as "an unfortunate situation as far as this country is concerned," the fact that Canada, not having a lend-lease agreement with U.S., was able to purchase outright from the U.S. Army some $90,000,000 worth of airport construction in Canada, and Goose Bay airport in Labrador. America had "obligated itself" for 50 per cent. of the cost of building Goose Bay, for which it would have been entitled to retain a post-war use interest, but under the terms of the agreement Canada could elect to pay the entire cost herself, and did so.

STORNOWAY AIRPORT

THE claim of Stornoway Airport to be one of the subsidiary landing fields on the North Atlantic air route, via Iceland and Greenland, is being brought to the notice of Mr. M. K. Macmillan, M.P. for the Western Isles, by the Town Council of Stornoway. Nothing could be done until after the war, said ex-Baillie Tolmie, who sponsored the proposal, but the Town Council should see to it that Stornoway was not overlooked.

It is unlikely that the Air Ministry will consider Stornoway as a refuelling point, adds our Scottish correspondent, when excellent facilities remain at Tiree for refuelling and maintenance. This station is also free from fog all the year round and has excellent runways.

Civil Aircraft Engines

Mr. Hives on Rolls-Royce's "Campaign Programme" : Discussions at R.Ae.S.

PART I of the all-day debate on civil aviation held by the Royal Aeronautical Society recently was reported in our issue of November 9th. Below we give a summary of the talk given by Mr. E. W. Hives, of the Rolls-Royce firm, on civil aircraft engine design, and part of the subsequent discussion.

Mr. Hives began by drawing attention to the interesting fact that in all discussions and articles on civil aviation, engine reliability was taken for granted. That indicated that the engine designer and manufacturer had achieved a high degree of success. There was now, he said, a vast accumulation of data and experience on the technique of design, manufacture and operation of aircraft power plants, and the engine manufacturers were in a position to meet any reasonable demand in the way of power, fuel consumption, weight, reliability and compact installation.

Careful consideration must be given by the users, when deciding upon the power plant specification, to ensure that the best compromise was attained in all-round economic operation. This could only be arrived at by collaboration with the engine designer and from the detailed analysis of airline experience, as shown by a breakdown of the cost figures. On these a great deal of information was available.

In ground transport it was customary to express overhaul periods in miles, and he thought the same should apply to aircraft engines. Rail and road transport reached approximately 100,000 miles between overhauls. Civil air transport did that or better and was expected to improve. The customer expected his fare to be based on mileage, with a premium for an express or high-speed service. He suggested that it was, therefore, wrong that any credit should be given for the length of time the engine was in the air. Mileage, not hours, was the logical basis for aircraft and general maintenance periods. He did not agree that no military engine could be adapted for civil work; nor that the only engine capable of survival in the competitive world was the large-capacity, low-piston speed and low-boost type.

Civil transport engine requirements were summarised by Mr. Hives as follows:

Highest possible maximum continuous cruising powers at from 10,000 to 25,000ft., with take-off power twice that of normal cruising; single-lever control, with power-plant components automatically controlled; low weight; low installed drag; low fuel and oil consumption; reliability over long periods, with minimum maintenance; long periods between overhauls; low cost of overhauls; compact design and quick changing of complete power plants; low initial cost.

The difference between military and civil versions was a difference in the "mix" of these characteristics.

In connection with overhauls, Mr. Hives said that it was often said that 1,000 hours between overhauls was necessary. It was reasonable to expect that the life of a big engine at low specific power would surpass that of a smaller engine running at higher boosts and higher piston speeds. But if the installed weight of the larger engine was 3,740 lb. and it gave 1,000 hours' overhaul life, and the smaller engine at 3,300 lb. gave 750 hours, in one year one engine would be overhauled three times, the other four. The difference in cost might be £350, but the earning power of the lighter engine, in the form of extra pay-load, would probably exceed the £350. He would separate the reliability target into two parts: 100 per cent reliability up to some conservative number of hours, and a second objective, which should be a gradual and cautious extension of the overhaul period up to as long as economic research indicated it to be desirable.

Engine Change

Turning to the subject of power-plant changes, Mr. Hives said such a change could be made in an hour. The time could be shortened by using expensive ground equipment, but he thought it better to concentrate on giving 100 per cent. reliability up to the overhaul time, when the time taken did not matter so much.

Mr. Hives regarded fuel economy as the most important single factor in the development of civil engines. Statistics showed that fuel and oil accounted for about 18 per cent. of the total operating costs. It was often claimed that best fuel economy was given by the big engine running at low piston speeds and at cruising boost, which virtually made it a naturally aspirated engine. This needed qualification. Data obtained on a range of engines from 21 to 42 litres indicated that for a given horse-power at a given altitude the specific consumption remained constant. He quoted an example of two engines, one of over 40 litres and a lower-compression engine of under 30 litres. Cruising at 10,000ft., the larger engine showed a consumption of 0.415 lb./h.p./hr., the smaller 0.44 lb./h.p./hr. The installed weights, with airscrew, were 3,740 lb. and 3,300 lb. respectively. Thus only on flights of over 28 hours did the fuel saving justify the extra weight of the bigger engine. If the cruising altitude were raised to 25,000ft., the difference in consumption became even smaller, because the big engine with its higher compression ratio had to run richer to avoid detonation.

Considerations such as those outlined had, Mr. Hives said, led them to the conclusion that a more fruitful field was to endeavour to maintain consistently low fuel consumption by accurate control of the fuel-air ratio, by even distribution between cylinders, by judicious selection of compression ratio, and by full utilisation of the energy in the exhaust. Figures from many North Atlantic crossings showed wide variations, and he did not agree with the ultimate need for a flight engineer as a method of ensuring consistently low consumption. Automatic regulation of all components was an accomplished fact. The man, his personal equipment, and the extra equipment built into the aircraft on his account would be not less than 500 lb.—lost pay-load. When the engine manufacturer has designed away this loss, he should be credited with this increase in the aircraft's earning power. The engine manufacturer would continue to struggle for a reduction of another few per cent. in consumption, but there was another and very fruitful source of increase in pay-load. It was normal practice to carry up to 25 per cent. extra fuel to allow for errors in navigation or in weather forecasts. This might represent anything from 30 per cent. to 50 per cent. on a route such as the North Atlantic. Improvements in aids to navigation could thus save more fuel than the engine manufacturer could ever hope to save.

"I strongly recommend," Mr. Hives concluded, "that the operator should go to the engine man with both his hopes and his disappointments. He should treat with great respect recommendations and suggestions put forward by the engine man. We would plead for the greatest possible breadth of vision so that we do not find ourselves with a product unnecessarily over-developed in certain characteristics and lacking in some other, equally important, direction."

The Discussion

LORD BRABAZON OF TARA, in opening the discussion on Mr. Hives' talk, regretted that no reference had been made to jet propulsion, and hoped that the discussion would bring a strong attack on behalf of the jet engine against the reciprocating engine. He would also like someone to press for a definition of horse-power. Mr. Hives was one of the worst offenders because he had started with an engine of 1,000 h.p., and over the week-end it had developed about 2,000 h.p.! Then they were told that it could be run on civil aircraft at 60 per cent. power, so that it was extremely difficult to arrive at the actual cruising power.

Concerning Mr. Chadwick's talk, Lord Brabazon said that he wanted to know whether one was going to run into trouble with landing gears on aircraft weighing 250,000 lb. Other matters which required attention were landing in conditions of complete invisibility and pressurisation of cabins. The first country that developed satisfactory pressurisation would have a great advantage over others.

MR. W. E. W. PETTER said the fact that the operator could pay the equivalent of the first cost of an aircraft in one year in the cost of fuel drew attention to what was both an engine and an aircraft problem. We required engines using cheaper fuel and less of it, but, apart from what the engine makers did, the aircraft designer must do something about it. Present-day aircraft required far too much power to propel them through the air, and an effort should be made to reduce drag. He thought a minimum drag coefficient not much more than one-half of that which obtained to-day was a possibility. A large proportion of the drag built into our present aircraft was due to power plant. The engine maker sought to protect himself by insisting on a power plant which he knew would work, although in terms of drag it might be an anathema to the aircraft designer. The two would have to get together, and engines must not sit on the wings much longer. The problem of pressurisation needed some consideration, and Mr. Petter was sure the problem could be solved without serious increase in cost of structural weight.

AIR COMDRE. R. BANKS agreed with Mr. Chadwick that a trip to Australia in 1,000-mile hops would be comfortable, and for those who wished to get there quickly he suggested a service of supermailplanes with room for a few passengers, driven by turbines and travelling perhaps at 500 m.p.h. On the subject of engines he was in favour of good take-off and afterwards cruising at 35 to 40 per cent. of this power. He suggested that the way to get better

CIVIL AIRCRAFT ENGINES

fuel economy was to make use of the exhaust, and expressed the view that in ten years we should not use the reciprocating engine for high horse-powers but should use turbines and jets. On the question of fuel cost, he pointed out that, although the difference in cost between diesel fuel and petrol was great in the Gulf of Mexico, the distribution costs were the same for both, so that by the time the fuel was delivered there was not quite so much to choose between them. Referring to fire risk, he thought we might have to adapt bullet-proof tanks to civil aviation.

MR. A. R. OGSTON agreed with Mr. Chadwick about the annual fuel cost being roughly equal to the first cost of the aircraft. On the question of fire, he pointed out that in the case of a minor crash petrol would leak on to the ground and immediately the aircraft would be bathed in a sea of inflammable vapour. If there were ignition in contact with the vapour there would be a conflagration. If a safety fuel or diesel oil were used, this would have to fall on a hot part before it vaporised, and the speed of fire would be very much slower.

MR. IVOR LUSTY wondered why it was that when aircraft engines were started there was a lot of growling and banging. Even on the cheapest motor car that did not occur. On the problem of cruising speed he said he had just completed an investigation from a different angle. On a long flight it was necessary to carry reserve fuel, but, having taken this on board, was it best to stick to the normal long-range cruising speed and arrive with a lot of petrol still in the tanks, or to use up the reserve in increased speed?

MR. C. G. GREY welcomed Mr. Chadwick's emphasis on the importance of safety first. He said we did not really yet know anything about aerodynamics. He took as an example two aircraft, the Flying Fortress and the Liberator. One appeared to the ordinary eye a most highly streamlined thing. The other had a nose like a bulldog and was about as streamlined, including the curly tail. The curious thing was that these two aircraft gave almost identical performances. This had forced him to the conclusion that both must be wrong.

Pressurisation

MR. A. DAVENPORT said the greatest consideration was safety. With regard to comfort it was necessary to solve the problem of pressurisation, and an allowance of one to two per cent. would have to be made for the cabin equipment. Safety also depended largely on the blowers, and for these one would have to allow from 150 to 200 h.p. He referred to the fact that pressure chambers were now being built for the full use of those interested. In these, the largest, or nearly the largest, lock-up cabin could be tested at the equivalent of any altitude. [Mr Davenport was too modest to say so, but it may be inferred that he was referring to the equipment installed at Yeovil by Westland Aircraft. This firm has for several years taken a keen interest in pressurisation problems, blowers, valves, etc.]

CAPT. FRAZER NASH thought the aim of designers should be to introduce new and improved variable-lift devices so that a small wing could be used for cruising and top speed, and the maximum only for take-off and landing. That would be preferable to climbing into the stratosphere in order to ensure low resistance. It was cold at that height, and there was nothing to see!

MR. S. SCOTT-HALL said that seven years ago there was a lot of talk about safety. Having been away for that time he had hoped that by now flying had become much safer, but from the discussion it did not appear that we had progressed much farther. He suggested that a complete analysis of safety features should be made.

MR. F. F. CROCOMBE thought there was room for the very large aircraft, and the tailless offered improvement in the form of less drag and lower structure weight. He had in mind machines from 200,000 to 300,000 lb. all-up weight.

MAJOR G. P. BULMAN recalled that it was only by the amount of work put into development that one could judge the potential power and value of an engine. That would apply equally to the gas turbine as it did to the piston engine; because the gas turbine was novel and, therefore, attractive, we must not forget that it was still an engineering matter and must be developed.

GROUP CAPT. G. W. WILLIAMSON referred to various R.A.F. Committees which had given a lot of assistance and which might not persist in civilian life. One was the Technical Equipment Committee; another considered design to ensure low maintenance. In America they had no such committees, and he had taken over aircraft which had solid sheets of aluminium covering at points where one would have to inspect rudder and elevator controls. That meant modification in this country. He did not think the flight engineer could be eliminated, even if Mr. Hives should make his engines 100 per cent. automatic. There were always such things as multiple tanks, and until we could get away from the practice of installing them in the wings, it would be necessary to carry a flight engineer.

MR. HOLLIS WILLIAMS said an airline had to sell comfort as well as speed. This country could provide the best possible both in aircraft and power plants, but he was not so sure that we had adjusted ourselves to comfort and luxury travel. We should have to learn the hard way by designing, improving and designing again. When we tackled the problem of suppressing sound and vibration and getting ventilation positions right inside the cabin, it could mount up into a job equal in magnitude almost to the rest of the outfit. On pressurisation he said the ideal was not only to maintain pressure and control in the cabin, but also to control the rate of change of pressure. That seemed to be an enormously difficult problem.

THE CHAIRMAN recalled that some years ago in his Wilbur Wright lecture Dr Roxbee Cox had proposed an aircraft of 600 tons weight. Perhaps he would like to tell them how he felt about that now.

DR. ROXBEE COX said his statement was as true to-day as at the time he made it, but pointed out that at the time of the Wilbur Wright lecture he was engaged in solving the problem of how big we could make aircraft if we wanted to make them big. How big we wanted to make them was an entirely different matter.

With regard to aircraft form, Mr. Chadwick had expressed a preference for the conventional. Mr. Crocombe preferred the tailless, and limited it to sizes of 200,000 lb. or above. It was necessary to differentiate between the tailless and the all-wing type of aircraft. The latter necessarily had to be of some 200,000 lb. weight, and if it had to give the sort of comfort which Mr. Hollis Williams demanded, it would be of 300,000 lb. weight. His own feeling was there was a great field for the tailless aircraft of quite modest size.

He agreed with Mr. Chadwick about the comfort of 1,000-mile hops at a speed of 250 m.p.h., but that sort of progress could not be applied universally. There were journeys, such as the transatlantic and transpacific crossings, for which greater ranges and speeds had to be provided. He was not convinced that very long ranges could not be obtained with relatively small machines by the use of certain devices. The gas turbine did give aircraft a chance to do very much greater speeds. The statement that high fuel consumption limited the use of jet propulsion was wrong. It was a gross over-simplification. The real point was that when the jet propulsion engine was used at high altitudes it became an economical device, and aircraft fitted with it would travel a very long way at very high speed. It would give us, in carrying capacity and range, all that the reciprocating engine would give and it would get there in half the time. From that statement, working backwards, one could find out the fuel consumption of the jet propulsion engine! From the work now being done, it would appear that the gas turbine would be more economical than at present and would give ranges greater than could be achieved with the piston engine.

Fuel Reserve and Speed

He pointed out, in connection with the 25 per cent. fuel reserves for contingencies, that the higher the rate of travel, the smaller that amount need be, and so there might be a further economic advantage in the use of gas turbines which gave higher speeds than could be got by any other means. In achieving the very high speeds of the future, we should have a most serious series of aerodynamical problems to solve.

In replying to the discussion, MR. CHADWICK said he did not foresee any difficulty with landing gears for aircraft up to 100 tons, and he agreed that the blind-landing system must be developed up to 100 per cent. perfection. He had not mentioned pressurisation because he had taken it for granted. Both Mr. Petter and Mr. Davenport had done a lot of work on pressurisation. He was pleased that Mr. Petter was so optimistic about the reduction of drag to about half. He would have to talk to him privately afterwards to find out how he proposed it should be done!

He agreed with Mr. Petter about getting the engines off the wings, but said he did not like the idea of sitting in the fuselage with a lot of engines running. On the subject of safety and fire risk, Mr. Chadwick called attention to the development of the nitrogen system, which he thought might be used universally on civil as well as on military aircraft, and he thought we might have to stick to the self-sealing type of tank, although he believed the tendency would be to use integral wing tanks.

MR. HIVES said engines to operate in conjunction with pressure cabins were available for air transport. The real terror of the sky was icing. Much of the inability to keep to schedule was due to icing conditions. The way to get out of that was to "get upstairs," and engines were available to do it. He did not hold out much hope for reduced fuel consumption. He believed the reason the diesel had not gone ahead was that it did not fit into aircraft requirements very well. We were becoming stabilised on double the power for take-off as for cruising. The diesel engine would be very much heavier than the present engine if it had to maintain that same ratio.

In connection with starting difficulties, he pointed out that in aircraft they were allowed only the same size battery as that required for a small car. The engine had to turn over very slowly and therefore cut out. We could ensure easier starting if we could accept more weight for starting equipment. Whilst agreeing that speed was relative to comfort, he urged that the greatest comfort was to get the journey over quickly. In the air one really could travel fast in safety. The fact that his firm was in the jet propulsion business might be accepted as evidence that they thought it had a future. The evolution would probably follow that of the conventional engine. The auxiliaries and additions in present engines amounted to much more than the whole engine used in the last war, and yet they all paid a dividend. The variable-pitch airscrew, the supercharger and a lot of other auxiliaries did a very good job. He thought in the same way the jet would develop and become progressively more efficient. On the question of the flight engineer, he did not want to carry in the air a fellow who was a "tuner-upper." The time was coming when it would be possible to dispense with the temperamental carburettor. Then it would be possible to get better results by getting rid of manual control.

Next week we shall publish a summary of the talk given by Mr. W. P. Hildred, Director-General of Civil Aviation, on air route facilities, and the general discussion with which the meeting concluded.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Pests Over Buda

TO counter the Russian attempts to encircle Budapest the *Luftwaffe* has sent its top-scoring air aces to Hungary.

Among them are Lt. Col. Rudel, the leading tank buster, Capt. Hartmann, the best German fighter pilot, credited with a score of 306 air victories, and Major Barkhorn, with 274 destroyed aircraft to his credit.

Luftwaffe Losses

THE German Radio reported the death in action of Lt. Otto Dommeratzky, the German fighter-bomber ace.

* * *

Lt. Col. Freiherr von Grevenreuth, Commodore of a bomber squadron and bearer of the Knight's Cross of the Iron Cross, has been killed in an accident.

Mysterious Disappearance

THE special correspondent of *Agence Anatole* reports from Bucharest that an aircraft bound for Moldavia with medical supplies has mysteriously disappeared. All stations were informed and an investigation has begun.

Still Less Knowledge

THE neglected education of *Luftwaffe* auxiliaries is the subject of a German newspaper article, which says that although 18 hours per week have been scheduled to lessons, there were serious difficulties in carrying out the tuition programme.

"During the next few years"—the article concludes—"a certain lack of knowledge will become evident at the universities and in business, but this can easily be overcome by diligence and good will."

Good Work

THE recent attack by the Danish patriots on the German "West" airfield at Lindholm, near Aalborg, was so extensive that it may be described as the most daring attack so far on German military targets in Denmark. For three days and nights time-bombs kept exploding at short intervals in different buildings on the airfield, while German nervousness increased hourly. About 30 German aircraft are believed to have been destroyed or heavily damaged.

On the night of November 2nd the first German hangar fell to pieces and a workshop was destroyed. On the morning of November 4th the officers' canteen blew up, and several German officers were killed or wounded. The hangar contained 20 aircraft. In the course of November 4th the Germans succeeded in finding an explosive charge leading to a bigger charge behind an oil tank, but the bomb exploded as it was being dismantled and the leader of the disposal squad was killed. Later on November 4th there was a big explosion in another hangar, believed to contain ten aircraft. Still later on the same day another bomb exploded.

The situation became by then so involved that the Germans assembled the Danish workers on the airfield, carefully examined them and then sent them home. Most were discharged or transferred to other German places of work.

On the Run

GERMAN industry is being chased round the Reich by the Allied bomber squadrons, says a correspondent of the *Vecke-Journalen*. It has been saved from complete destruction by decentralising it over the entire country, but it is, nevertheless, unprotected, for the Allied bombing spies have for years chased Krupps all over Germany, from Westphalia to the Luneburger Heide, and from there to Silesia, Thuringia, Bavaria, Carinthia and Styria. In some towns factories have been established in new underground railway tunnels which have never been in use. Armament production is always on the move, particularly those enterprises engaged in the manufacture of optical instruments, etc., for the aircraft industry.

Germans who had just evacuated to small villages in the mountains frequently expressed displeasure when representatives of the Minister of Armament and War Production came to inspect the countryside, which was in itself enough to make the population uneasy. When afterwards workers arrived to erect the foundations, panic gripped the village.

A single aircraft factory may have about 20 separate workshops, so that production is so decentralised that work can be resumed somewhere else a few days after one workshop has been bombed. Only in this way can German armament production be maintained at all. Naturally, it costs much time and labour to maintain this "underground" production, and once the Allies have air bases near the German frontier the difficulties will increase enormously and, in the long run, the underground battle of production against the Allied bomber squadrons may turn out to be completely useless.

The closer the Allies approach to the heart of Germany the worse will become the communications which play a decisive part in this necessary decentralisation. In the last phase of the war bridges and railway lines will be blown up to a large extent and then engineers and workers will have to wait in vain for materials. The German armament industry is not safe anywhere, says the correspondent. "The German armament factories and underground installations only have a breathing space until the enemy discovers them, the type of goods they produce and their production capacity. For some weeks they bomb aircraft, particularly fighter aircraft, factories, then oil refineries and then, perhaps, communications, so that those factories which are left alone can work to full capacity. Moreover, artificial fog is a fairly effective protection, particularly for large factories such as the Leuna works, which have built large dummy works to mislead the bombers."

Quitting

LUFTWAFFE fighter units are said to have almost disappeared from the central airfields in North Norway.

Neutral reports say that the main base near Altafjord, where the air force operating against the Murmansk route previously numbered about 600 aircraft, has now been reduced to five or six aircraft.

Air Clash

AN aircraft accident causing 16 fatal casualties has occurred at Lifjell, in Telemark (Norway). Among the passengers were a German General, other German officers of high rank, and the son of the Norwegian Hird and police chief Marthinsen. Well-informed circles say that the German general and his staff were carrying fresh instructions from German Headquarters, in case of a threatening development in North Norway. The aircraft crashed at night in thick fog.

Ruhr Report

THE *National Zeitung* of Essen gave this description of the conditions in the Ruhr: "In many large towns in the Ruhr tuition in schools had to be cancelled as early as 1943, as the parents were forced to send their children to other districts. The civilian population had been badly hit by the terror attacks. The fact is that *life in the destroyed towns in the Rhine and Ruhr is becoming increasingly difficult*. We do not know when our leaders will throw in the weapons which will change the course of the war, and we must therefore prepare ourselves to continue to live under the enemy air terror and to bear its consequences. Many thousands of women, children and old people who are still left in the ruined towns are finding it barely possible to live there, and it is doubtful whether they will continue to do so. A large-scale evacuation, not only within Western Germany, but also to other parts of the country, is absolutely necessary." The article concludes that "the community spirit of the German people is now facing its severest test."

V.2

THE fact that the main purpose of V2 at present is to bolster German civilian morale was confirmed by a report from the Berlin correspondent of the Stockholm *Morgentidingen* that Himmler has ordered 1,200 Gestapo officials to conduct a "Gallup Poll" to find out reaction to the new weapon.

They are to report on V2 in particular and on secret weapons in general.

The morale factor is also demonstrated by the fact that, for the past week, German papers have been headlining daily the alleged devastation caused in London by V2, relegating news of the East and West fronts to second place.

Claims are also made for the "astonishing accuracy" of the V2, and German propaganda is not shy to assert that the new weapon is far more accurate than the bomber and will be used in the near future "against the Headquarters of Allied military commanders in the field."

Modern Airscrews—IV

Elements and Procedure of Blade Design

By C. B. BAILEY-WATSON

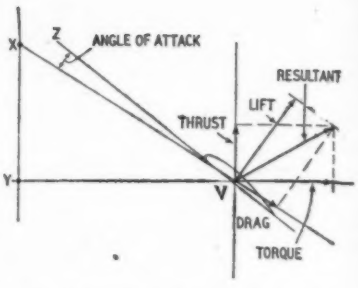
THIS series of articles on airscrews would not be complete without some consideration being devoted to the blades themselves. The subject of blade design is almost a science in itself and covers such a great deal of ground that in the space available here little more than a brief review of the cardinal factors can be given.

There is, of course, an excellent case for the employment of both wooden and metal blades, each having advantages indigenous to its type which fit it for specific applications; however, it is not the object here to give a qualitative analysis of blade types, and, in any case, from the aspect of design *per se*, there is little intrinsic difference involved whether the blade be metal or wood.

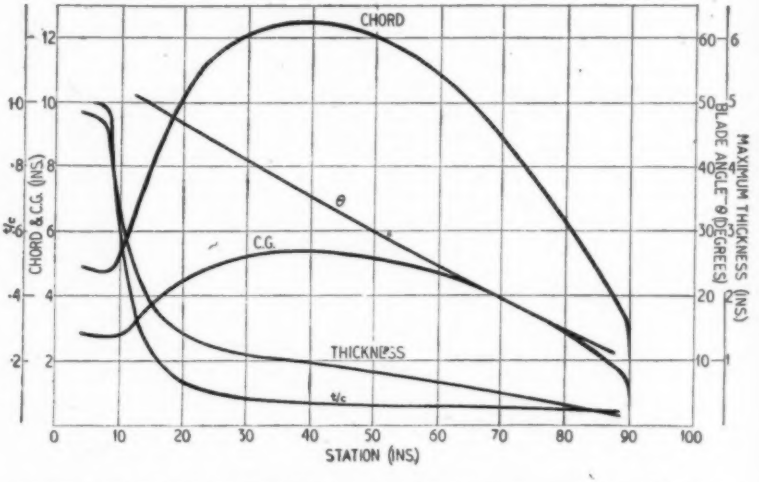
Probably the most important tendency in blade design at present is towards increasing blade area, no matter whether by means of wider blades or the use of more blades on a single hub. We have evidence of this in the recent production of a five-bladed airscrew and also in the development of contra-rotating types. The reason for this trend can be understood if one considers, in a simplified form, the operation of an airscrew.

An airscrew blade can be likened to a twisted wing rotated about one end, and the forces acting upon any one element, or section, of the blade can be roughly defined as in the diagram. The path of the element can be resolved into two components, one *Y X*, due to the forward speed of the aircraft, and the other, *V Y*, due to the rotation of the airscrew. The value of *Y X* is constant throughout the length of the blade, but *V Y* is greater at the blade tip than at the root, and is, therefore, proportional to the radius at which the selected element is located. From the diagram it can be seen that the path of the blade is along the line *V X* and that the angle of advance *X V Y* is small at low forward speeds and progressively larger at high speeds. The fact that *V Y* is greater at the tip than at the root of the blade consonantly makes the angle of advance *X V Y* smaller at the tip than at the root, and this is the reason for the twist given to the blade.

This element, or section of the blade we are considering is travelling along the path *V X* with an angle of attack *X V Z*, and the life and drag forces produced can be resolved into a thrust force, with the torque force opposing the airscrew rotation as shown. The efficiency of an airscrew is expressed as a ratio of power output to engine power input, and can be measured by the ratio of thrust to torque force for any given forward speed and airscrew r.p.m. This is influenced by the lift/drag ratio of the several blade sections, and the angle of advance, which, for any one design condition of airscrew speed and airscrew r.p.m., is fixed. It can thus be said that the main factor which can be used to enhance the airscrew efficiency is the lift/drag ratio of the blade sections.



The forces acting upon a rotating blade can be resolved as shown. There is always an angle of attack relative to the blade path.



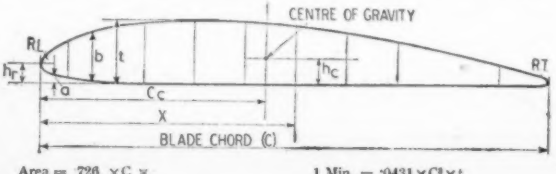
Curves of blade characteristics plotted against blade stations. The curve CG shows the disposition of the centres of gravity of the blade sections in terms of distance from the leading edge of the section.

The $\frac{L}{D}$ ratio, in turn, is governed largely by the angle of attack, and it has been found that the highest values of $\frac{L}{D}$ are obtained with an angle of attack of small positive value, say, 5 deg. To achieve, as near as possible, this condition, the blade is given a coarse root angle and a finer tip angle, this being linked with the variation in angle of advance throughout the blade length. In point of fact, the actual amount of twist imparted to the blade may be varied without too marked an effect on low speed efficiency, although it is of increasing importance at high speeds such as are current to-day.

As it is that area of the blade round about the station at 0·7 the blade radius which carries most of the torque and thrust loading, the efficiency of

x/c	hr	·025	·05	·1	2	·3	·4	·5	·6	·7	·8	·9	Rad.at T.E. R_T	Rad.at L.E. R_L
b/t	·2996	·4209	·5814	·7756	·9845	·995	·983	·928	·829	·689	·521	·3375	·077	·128
a/t		·1281	·0840	·0384	·0067									

Dimension and section properties for airscrew aerofoils of the modified Clark Y series. The figures in the top line above are percentages of the section chord, the nose being zero and the trailing edge 10.



Area = ·726 ×C ×
C_c = ·4405×C
h_c = ·418 ×t

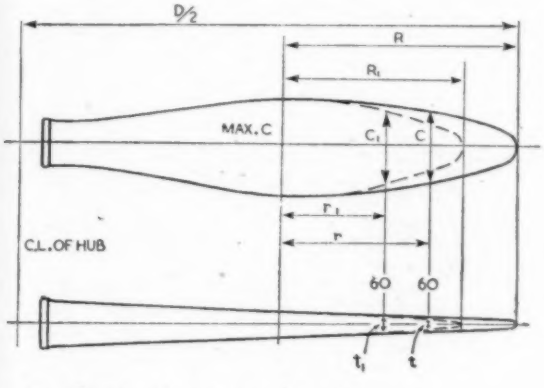
1 Min. = ·0431×C²×t
1 Maj. = ·0495×C×t²
t = Max. Thickness

MODERN AIRSCREWS—IV

an airscrew can be determined fairly accurately by the performance of the 0·7 station blade section, and when this section is operating at its optimum angle of attack, the efficiency of the airscrew will be near enough at its highest level.

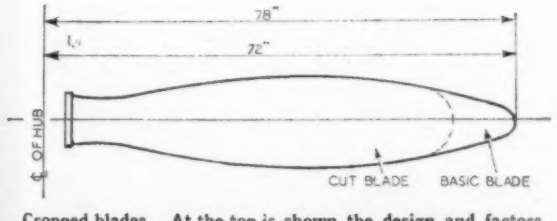
In consideration of the power absorption characteristics of an airscrew, it will be seen in the diagram that the power absorption is dependent upon the magnitude of the torque force, which, in turn, is governed by the extent of the $\frac{L}{D}$ forces. This leads to consideration of the way in which the power absorption can be increased. It is obviously not worth while to enlarge the angle of advance as this increases the angle of attack and reduces the efficiency obtained by the good $\frac{L}{D}$ characteristics. Again, the power absorption can be increased by extending the airscrew swept diameter, but space limitations usually preclude this although aerodynamically it is desirable; likewise, an increase of r.p.m. engenders tip losses from compressibility effects with a consequent drop in efficiency. We are left then with the course of increasing power absorption by enlarging the blade chord or putting more blades on the same hub, either of which can be done without too much sacrifice of efficiency. The effect is to increase the solidity of the airscrew, which is the ratio of blade area to disc area swept by the blades, or, the sum of the blade chords (usually at the 0·7 station) divided by the circumference of the circle on which they lie.

When an airscrew is to be designed, the limiting factors of size, etc., are given, together with the performance characteristics required, and with these data to start with the airscrew blade design begins. The aerodynamic requirements that the blade has to fulfil settle the diameter,

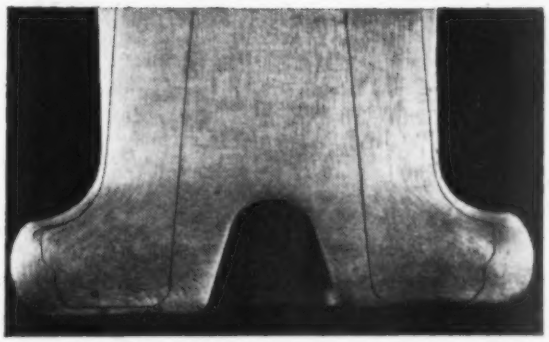


$\frac{r_1}{r} = \frac{R_1}{R}$ AND $\frac{C_1}{t_1} = \frac{C}{t}$ $\therefore \frac{t}{C} = \frac{t_1}{C_1}$

AND $\frac{t}{C}$ PLOTTED AGAINST $\frac{r}{R} = \frac{t_1}{C_1}$ PLOTTED AGAINST $\frac{r_1}{R_1}$



Cropped blades. At the top is shown the design and factors for telescoping a blade, and below is illustrated the reduction of airscrew diameter by the simple cutting of the blade tips.



This shows a section through the root of a Duralumin blade forging, the finished root profile being indicated by the black line. The grain flow of the "upended" root is interesting.

activity factor, thickness/chord ratio, the value of J at which the blade will operate, and the aerofoil section to be employed. Activity factor, diameter, thickness ratio and aerofoil section determine the general shape of the blade, whilst the J will determine the twist that has to be given to the blade. $J = \frac{v}{nD}$

where v = forward speed, ft./sec., n = airscrew r.p. sec., and D = airscrew diameter, feet. The activity factor is a non-dimensional quantity which is a measure of the power absorption of the blade, and it is obtained by chordal values at radii stations which, totalled, give the factor for the blade. It is defined as:—

$$AF = \frac{100{,}000}{D^5} \int_{0.2\,R}^{1.0\,R} Cr^3\,Dr$$

where R = airscrew radius, inches, C = chord, and r = radius of any blade element, inches.

A basic consideration throughout the whole design of a blade is that it must be smooth and fair in every direction, which means that all bumps or kinks in plan-form, section, thickness, or compound developed curves of these, must be entirely eliminated.

Blade Aerofoil Sections

The aerofoil sections most used are the modified R.A.F.6 and modified Clark Y. With the R.A.F.6 the ordinates of the leading and trailing edges are increased progressively towards the tip of the blade to reduce stress concentration. This progressive increase of ordinates means that the thickness/chord ratio is likewise reduced as the sections become thinner and the edges' radii smaller.

The blade shank is of circular section and it is not, therefore, possible to maintain the aerofoil section right down to the shank without introducing discontinuity into the blade shape, although this difficulty has been partly overcome on some wooden blades. This makes it necessary to divide the design of the blade into three parts, two, the shank and outboard stations, can be calculated, but the third is arrived at by fairing between the other two. The position of departure from true aerofoil section varies with basic blade radius; however, for normal types of airscrew between 10 and 13 feet diameter the standard aerofoil section can usually be maintained into about the 30in. station and the transitional sections from here to the circular shank given a reasonably good low-drag form; but the rapidity with which the plan-form can be developed into the aerofoil section is governed, to a certain extent, by manufacturing considerations. An important factor is the avoidance of stress concentration by providing large curvatures in the grain flow. For convenience, the blade is divided up along its length into 6in. stations taken from a datum which is usually the axis of airscrew rotation.

The plan-form of a blade is determined by the activity factor required, and as geometrically similar blades have the same A.F. and blades of the same diameter have A.F.s

MODERN AIRSCREWS—IV

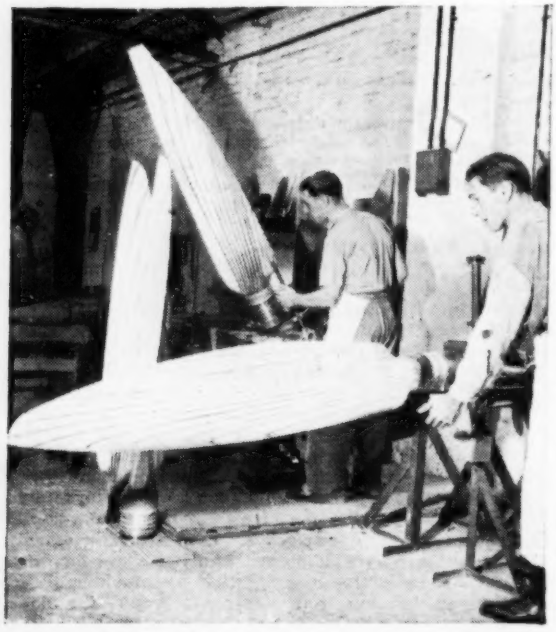
proportional to the corresponding chords, a plan-form to fulfil any desired A.F. can often quickly be evolved by the comparison of existing blade designs. Initially, only the developed plan-form need be considered, as the projected plan-form is dependent upon the sectional shape and the angle finally adopted.

Blade thickness is determined partially by aerodynamic consideration, but rather more critically by strength and vibratory factors. Usually, a thickness/chord (t/c) value is taken at the 0.7 radius station and a curve plotted inboard and outboard of this point following an existing curve for guidance. Generally speaking, if the 0.7 t/c is small, e.g., below 0.6 to 0.7, strength and rigidity will make it necessary that the t/c outboard of the 0.7 station be approximately constant, but for thicker blades, aerodynamic efficiency requires that the tip shall be reduced in thickness. From the t/c ratio curve and the plan-form a thickness curve may be drawn which, used with the area and chord curves has to be adjusted to conform with the final inboard sections.

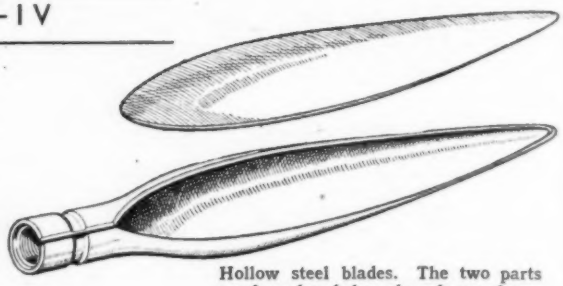
Areas of the outboard sections are obtained from the formula of the aerofoil selected; this is shown for the modified Clark Y series in a diagram. It is necessary that the various areas be calculated in the early stages in order that the area curve for the inboard sections may be plotted to fair into the shank; this curve will give a guide as to the size and shape—limitations within which the inboard sections must be kept.

C. G. of Blade Sections

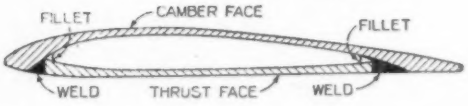
Centre of gravity positions are of cardinal importance in airscrew blade design, and it is usual to arrange the c.g. of each section to lie on the centre line of the blade. This simplifies manufacture and enables accurate vertical balance of individual blades to be obtained; it is also desirable from considerations of flutter. However, in certain instances it is beneficial to off-set the centres of gravity forward of the rotational plane to reduce bending stresses.



Wooden blades being individually balanced. An advantage of wooden blades is that a good aerofoil section can be maintained very close to the root. They are usually, size for size, lighter than metal blades.



Hollow steel blades. The two parts are forged and shaped as shown above, being welded together to form a complete blade with a cross section as below.



The procedure described covers briefly the fundamental operations of designing a blade, but there are, of course, elaborations of each stage concerned with much greater detail into which we cannot go here. There is, however, one further aspect of blade design which warrants inclusion; it is that of cropping the blade tip, which is a measure resorted to in order to save making separate basic blades for every individual application. This can be done by either of two methods, cutting or telescoping. Cutting is the more usual method of reducing the airscrew diameter, the blade merely being cut to the required radius and the tip rounded to give a reasonable shape, this can be seen in the "paddle" or "butter pat" blades used on so many Americal aircraft.

The standard practice is to cut the blade radius to a maximum of 6in., but if it is necessary to reduce the airscrew diameter further, then it is advisable that the chord and thickness of the stations nearer the tip be reduced to avoid having an inefficient blade; this is called telescoping, and it involves moving the tip stations in towards the shank. Most usually, the method is to take the sections outboard of the maximum blade width and reduce their nominal 6in. interval in the ratio of the distance from the maximum blade width to the tips of the basic and telescoped blades. This involves some new calculation and curve plotting, but nothing like the amount of work needed for a fresh basic design: cut and telescoped blades are shown in one of our illustrations.

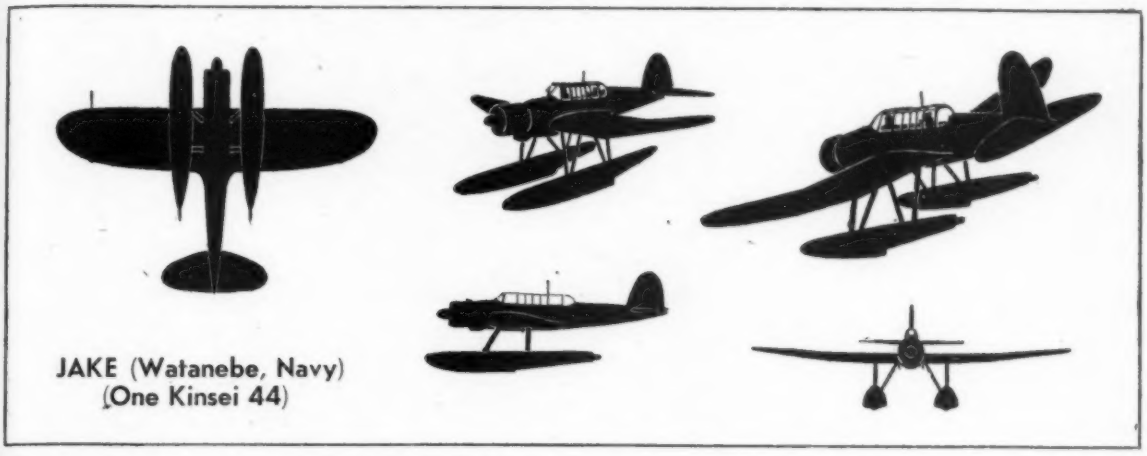
Airscrew blades are to-day made in various materials and on necessarily different manufacturing principles; for example, in this country most blades are made either from improved wood or from duralumin forgings. In America many airscrews are fitted with hollow steel blades, and the success of this type of blade makes it likely that before long British blade manufacturers may start producing them. The actual methods and processes of blade manufacture are so varying and conflicting that the subject is nearly as large as that of blade design, in any case the detail design and all elements of design other than fundamentals are inextricably linked with the specific type of blade manufacture, so that no reference can be made to this side of blade production other than the accompanying illustrations of the different representative blade types.

The subjects of blade design and manufacture may, in the future, very likely receive further intensive development to fit in with the inevitable use both of the airscrew-gas turbine, and the direct reaction systems of aircraft propulsion, and even without that fillip, airscrews as used to-day have a very long life ahead of them.

The subject matter of this article is the method employed for the design of de Havilland airscrews, and the author wishes to express his appreciation of the assistance given him by that company.

Studies in Recognition

Aircraft in Flying Attitudes



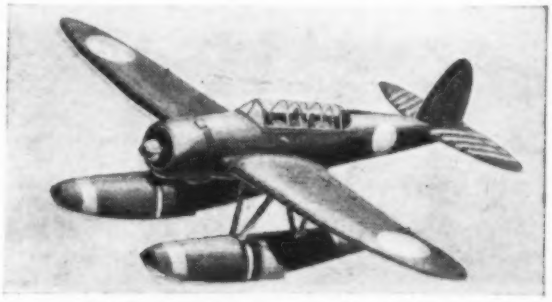
JAKE (Watanebe, Navy)
(One Kinsei 44)

RATHER obviously inspired by the Arado Ar 196 2-seater reconnaissance floatplane, which their German friends found quite a useful aircraft, the Jake is a Watanebe production in fairly wide use with the Japanese Navy.

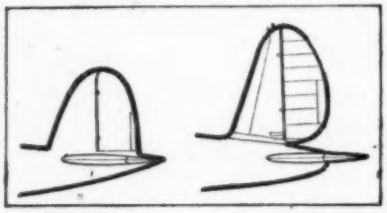
It is, however, a little smaller in overall dimensions than the Arado and it seems doubtful if it is quite so well armed.

Confusion between these two Axis floatplanes is of little practical consequence, and the comparison offered here is mainly of academic interest.

Their respective wings are very similar in plan but the Jake has dihedral from a wide flat centre-section, whereas the Arado has it from the roots. The more simple float struts of the Jap as compared with the rather elaborate German layout is a useful recognition point, but the biggest and quickest seen difference lies (once again!) in the tail



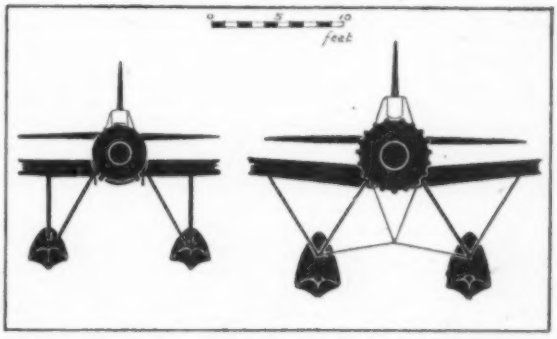
Jake (Watanebe) Reconnaissance-bomber



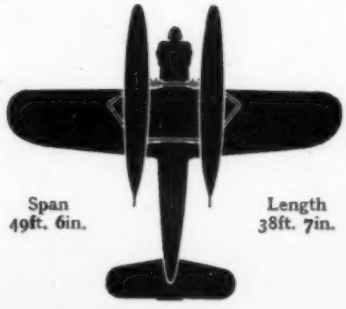
The squat inverted "U" fin and rudder of Jake (left) contrasts with the tall vertical tail surface of the Ar 196, and its projecting elevator.

assembly, as can be seen at a glance; the tall Arado fin and rudder outline is quite graceful in contrast to Jake's inverted "U" surface, while their respective tailplanes could scarcely be confused owing to the marked difference in aspect-ratio.

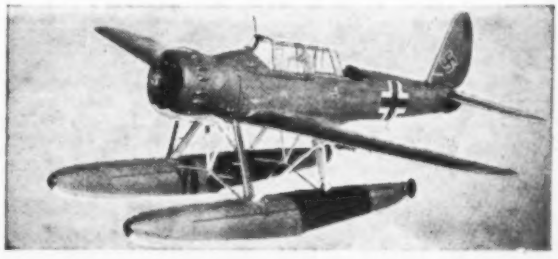
As regards fuselage shape, the Jake has a slimmer line, with a lower and less angular cockpit cover than that of the German. Dimensions of the Jake are: Span 46ft. 10in., length 37ft. 2in.



The cross-braced floats and helmeted engine cowling distinguish the Arado (right) from the Jake when head on. The difference in dihedral is also apparent.



The bulge of the helmeted engine cowling on the Arado Ar 196 distinguishes it from the plain cylindrical nose of the Jake. The German floatplane's wings have rather blunter tips than those of the Jap and its tailplane is of much greater aspect ratio.



Arado Ar 196 2-seater Reconnaissance floatplane

Q.F. Mosquito

Coastal Command's Mark XVIII Attacks U-boats with Six-pounder Gun

ON a bleak morning last winter a homecoming U-boat was proceeding slowly to base in the calm waters south of Brest. For weeks it had been at sea, always fearing attack from constantly patrolling R.A.F. Coastal Command aircraft or from the warships of the Royal Navy.

At last they were in safe waters. . . .

But as first light stole across the sky their peace was shattered by the sounding of the alarm, "Enemy aircraft approaching."

From out of the rising sun Germans on the conning tower picked out a Mosquito aircraft diving towards them. A red ball came streaking across the sky and there was a tremendous crash as the U-boat was hit by a large shell which killed several of the crew.

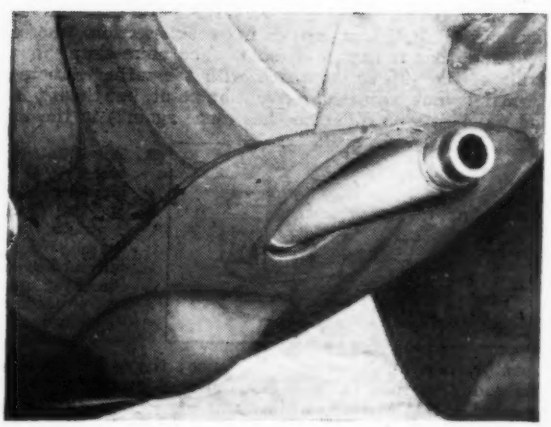
This was the first attack on a U-boat, made on November 7th, 1943, with one of Britain's secret weapons—then newly introduced—the six-pounder gun carried by the Mosquito XVIII of R.A.F. Coastal Command, some details of which are now officially revealed.

Subsequent events showed that the German Admiralty had to change their in-shore tactics. Waters close to the French coast could no longer be considered safe for unescorted U-boats, and even boom- and gun-defended harbours could be penetrated by the speedy and manœuvrable Mosquito armed with the new gun.

Following the first two attacks with this weapon, the German Admiralty were forced to provide an escort of surface ships and fighters to protect their U-boats leaving or going into the harbour, thus diverting *flak* ships and armed trawlers from other duties. But in spite of *flak* from escort vessels and "umbrellas" of fighters, Coastal Command Mosquitos have persisted in their attacks on the U-boats with marked success. The accuracy of the gun was proved when a shell from it shot an enemy fighter out of the sky.

(Above) The Mosquito XVIII, with a six-pounder mounted below the four 0·303 in. machine guns in the nose.

(Right) This close-up of the "Mossie's" latest armament shows its very compact, yet accessible, installation.



The gun is slung beneath the fuselage of the Mosquito, and fires shells in quick succession as the aircraft dives to attack. Since D-day it has been used extensively aganst U-boats attempting to slink into the Channel to interfere with our landing craft. In addition to its six-pounder, the Mosquito also carries four machine guns.

The gun was first fitted to three Mosquitos which became a detachment of a secret experimental squadron. Sqn. Ldr. C. F. Rose, D.F.C., D.F.M., was the first C.O. of the detachment, which operated from an airfield in the south-west of England, and there were three other pilots— 26-year-old F/O. D. J. Turner, D.F.C., of Hornchurch, Essex; F/O. A.L. Bennett, 24-year-old R.C.A.F. pilot of Vancouver, and F/O. A. H. Hilliard, aged 24, of St. Albans, Herts.

"We were naturally very excited at being the first to use the gun," said F/O. Turner, "and we practised at sea for some time, firing one shell and then trying to hit it with others. We soon became quite accurate."

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THERE'S NOTHING NEW .....

Modern Devices Anticipated

THE brief particulars of the method of launching "V.2" which have recently arrived from Holland indicate that the projectile is fired from a well or shaft sunk deep into the ground.

This reminds one of the book, written very many years ago by Jules Verne, entitled "From the Earth to the Moon." In this story, a projectile was fired from a monster gun sunk into the earth in a deep shaft. This story is well worth reading, in view of the development of this latest "secret weapon."

Whilst on the subject of early anticipations of modern devices, possibly some of your readers may remember the toy boats of some 45 years ago, in which jet propulsion was used. The method was to have a loop or coil of fine-bore brass tube heated by a spirit lamp. The ends of the tube projected through the stern-post of the small boat. Steam generated in the coil propelled the boat by a series of impulses.

This seems to be the perfect prototype of the Flying Bomb "Chuff-Box," having practically no moving parts.

W. ADAM WOODWARD.

POST-WAR CIVIL AVIATION

Disappointment with R.Ae.S. Discussion

ON Saturday, November 4th, an impressive gathering of personalities, directly and indirectly concerned with the aircraft industry of this country, attended an all-day session in London, to discuss various aspects of post-war civil aviation.

As one sitting humbly in a back seat, although admittedly unable to attend after the tea interval, I felt somewhat disappointed and failed to appreciate what was achieved. Perhaps I was expecting too much, but nevertheless venture to suggest that such a body should be in a position to make its presence felt, and on such an occasion at least arrive at some statement to put forward to the appropriate authorities.

It would appear that the sessions on Design and Economics should have been more closely linked, but I for one could not help feeling that the design authorities showed a complete inability to appreciate or even to wish to discuss the economics with which the operator is concerned. One would have thought that it was a golden opportunity to have at least obtained views on, or to have set up a Committee to analyse, such points as:—

(*a*) The types and sizes of aircraft considered most suitable for our internal and feeder-line services.

(*b*) The type and size of the aircraft for various overseas services.

(*c*) Where the flying boat would find itself placed in relation to the services to be operated, the size of the aircraft to be used and the cost of making and maintaining the necessary seadromes.

These are only a few points which are, however, vitally important, for there are thousands of aircraft operatives and technical staff members to-day anxiously waiting for signs as to what the future holds for them, and I would submit that those in authority are under an obligation to show that something concrete is being done in the way of future planning.

I came away feeling that even Sir Frederick Handley Page had missed the opportunity of quoting from The Book: "Where there is no vision the people perish."

It would be interesting to know the thoughts of others who attended.

J. H. LOWER, A.F.R.Ae.S.

"THIS IS TEST FLYING"

Have We Lost Our Sense of Proportion?

I AM positively palpitating—yes, even sitting here in the comfort and security of my armchair, I am shaking like a leaf. My palsied hand can scarce bear the brimming tankard to my quivering lips—and for why? Because I've just read an article entitled "This Is Test Flying" (*Flight*, November 9th), and, cor stone the crows! it's dangerous stuff.

For some years now I've regarded with tremendous admiration the expert production test pilots who can unfailingly trim an aircraft accurately without thought of a re-flight, but I find I really had no idea of the perils of their job. And the extraordinary thing is that whilst I mentally review my many test pilot friends, I can't think of a single one who would so lightly take his life in his hands—grey-haired they may be, and some are even verging on the (begging their pardons) hoary, but I put these outward signs of long life down to a very firm and unanimous disinclination to do their test flying in cloud.

Perhaps I should point out now that although I have had a crack at production test flying, I am not "one of the many," and if that sort of flying effort is expected of them, then I fervently thank the Almighty that my test flying is limited to experimental and prototype work. Less interesting, perhaps (though I have yet to be nauseated by all-out levels), but a far greater future apparently. I should also say that my limited production testing experience was gained in the palmy days of the Battle of Britain, when no one cared about the week's output total—much.

No, I'm definitely not the type to do "eardrum-cracking dives" (oh, shades of the "raking, broadside skids" of the good old B.O.P.) in cloud, with a broken cloud base of 1,200ft., already raining and a front forecast. Perhaps that is a sign of my approaching senile decay, but I do feel that if production testing, in these days of numerical air superiority, necessitates such flying in order to add one more aircraft to our week's total, then we have lost our sense of proportion. I think this ace ought to be given the biggest and best medal one can find for such deeds of derring-do—isn't Pilot Officer Prune the patron of the appropriate order?

(The article has just been read by a bloke of some 7,000 hours—ex-night-fighter type with a healthy regard for instrument flying. Said he: "Mind you, it wouldn't be such a bad article if it wasn't all in cloud; and if that's what goes on in half an hour of his working life, he must look forward to his free week-ends.")

L. B. GREENSTED.

THE FLYING BOMB

Support for Mr. Shackleton's Theory

AS one who has observed from the roof of an eight-storey building the landing of well over fifty flying bombs within distances varying from 250 yards up to three or four miles, and has seen or heard a great many more from less advantageous viewpoints, I beg to differ with "Anti-Squirt's" contention (*Flight*, November 2nd) that the jet propulsion unit does not cut-out at the moment of diving. I fully endorse Mr. Shackleton's statement in his first-class article to the effect that the operation of the spoilers, which cause the bomb to enter a dive, must create a negative "g" in the tank which throws the remaining fuel to the top and thus uncovers the outlet pipe located at the bottom. The behaviour of most of the flying bomb "landings" that I have seen confirms this supposition.

There were occasional exceptions to the above when the propulsion unit did continue to function when, owing, doubtless, to some vagary of the mechanism, the dive was a shallow one and the change of attitude was insufficient to create a negative "g" acceleration. In one or two instances I observed that after a momentary cut of the exhaust flame at the start of the dive, it restarted again before hitting the ground. I agree that where the jet unit stopped and the bomb continued to glide, the probable explanation was exhaustion of the fuel or a mechanical defect occurring before the pre-set distance had been traversed.

May I suggest that in arriving at his conclusions "Anti-Squirt" has perhaps overlooked the relatively slow speed of sound, i.e., 1,120ft. per second, whereas for all practical terrestial purposes light can be considered to be transmitted instantaneously. Thus, a flying bomb might pass overhead and proceed for, say, two miles before diving in; the observer would see the dive and the flash of the explosion while the reverberating sound of the propulsion unit still continues, since the sound is taking approximately ten seconds to reach the ear of the observer. In other words, there is a time lag of roughly five seconds for every mile in what is recorded by the eye and the ear respectively. I submit that this accounts for the illusion that the propulsion unit does not stop during the change from level flight into the dive.

A. R. OGSTON.

FASTEST EVER: The start of a Transport Command Mosquito's flight to India. The trip took only 14 hours 17 minutes flying time.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

GENERAL DUTIES BRANCH.

Air Comdres. (Act. Air Vice-Marshals) to be Air Vice-Marshals (temp.), June 1st, 1944: T. W. ELMHIRST, C.B.E., A.F.C.; H. K. THOROLD, C.B.E., D.S.C., D.F.C., A.F.C.; L. O. BROWN, C.B.E., D.S.C., A.F.C.; T. A. LANGFORD SAINSBURY, O.B.E., D.F.C., A.F.C.; J. W. JONES, C.B.; S. P. SIMPSON, C.B., C.B.E., M.C.; C. R. STEELE, C.B., D.F.C.; T. M. WILLIAMS, C.B., O.B.E., M.C., D.F.C.

Group Capts. to be Air Comdres. (temp.), October 1st, 1944: D. IRON, C.B.E.; R. G. GARDNER, C.B.E., D.S.C.; J. J. WILLIAMSON, A.F.C.; A. P. RITCHIE, C.B.E., A.F.C. (Act Air Vice-Marshal); G. O. VENN; J. A. BORET, C.B.E., M.C., A.F.C.; C. W. BUSK, M.C., A.F.C.; H. H. DOWN, A.F.C.; W. J. SEWARD, C.B.E.; F. BEAUMONT; E. F. WARING, C.B.E., D.F.C., A.F.C.; J. W. F. MERER; E. D. H. DAVIES; J. L. KIRBY, C.B.E.; H. F. V. BATTLE, O.B.E., D.F.C.; A. R. WARDLE, A.F.C.; F. L. PEARCE, D.S.O., D.F.C.; F. W. LONG; J. D. I. HARDMAN, O.B.E., D.F.C.; G. P. H. CARTER; A. HESKETH, C.B.E., D.F.C.; C. E. N. GUEST, O.B.E.; W. A. D. BROOK, C.B.E.; N. H. D'AETH, C.B.E.; C. B. R. PELLY, C.B.E., M.C.; R. S. BLUCKE, D.S.O., A.F.C.; D. A. BOYLE, A.F.C.; G. R. BEAMISH, C.B., C.B.E.; A. C. H. SHARP.

The following to be Acting Air Vice-Marshals: Air Comdre. K. B. LLOYD, C.B.E., A.F.C. October 19th, 1944.

TECHNICAL BRANCH.

Group Capts. to be Air Comdres. (temp.). October 1st, 1944: E. J. D. TOWNESEND; H. W. HESLOP, O.B.E.; D. W. CLAPPEN, L. DALTON-MORRIS, C.B.E.

EQUIPMENT BRANCH.

Group Capts. to be Air Comdres. (temp.). October 1st, 1944: T. G. SKEATS, C.B.E.; K. D. G. COLLIER.

ACCOUNTS BRANCH.

Group Capts. to be Air Comdres. (temp.). October 1st, 1944: W. G. W. PRALL; R. WHYTE.

Auxiliary Air Force

GENERAL DUTIES BRANCH.

Group Capt. G. H. AMBLER, C.B.E., A.F.C., to be Air Comdre. (temp.). October 1st, 1944.

Retirements

GENERAL DUTIES BRANCH.

Air Comdre G. C. BAILEY, C.B., D.S.O. September 25th, 1944.

Group Capt. (temp. Air Comdre.) H. M. PROBYN, C.B., C.B.E., D.S.O., retaining the rank of Air Comdre. September 25th, 1944.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards for distinguished services while operating with the Royal Air Force in successful attacks on the enemy:—

Distinguished Flying Cross

Act. Lt. Cdr. (A) S. L. DEVONALD, R.N.

Act. Lt. Cdr. W. J. MAINPRICE, R.N.

Act. Temp. Lt. Cdr. J. B. HARROWAR, R.N.R.

Temp. Sub Lt. (A) T. N. HUNTER, R.N.V.R.

Temp. Sub Lt. (A) R. N. WADHAM, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Act. Flt. Lt. R. M. ETCHELLS, R.A.F.V.R., No. 156 Sqn.—One night in August, 1944, Flt. Lt. Etchells was captain of an aircraft in an attack on Kiel. Just as the bombs were released over the target, the aircraft was attacked and damaged by an enemy fighter. An engine was put out of action, the rear turret was rendered unserviceable and the fuselage holed in many places. Nevertheless course was set for base. The enemy coast was safely crossed but shortly afterwards Flt. Lt. Etchells was compelled to bring his aircraft down on to the sea. The crew got safely aboard the dinghy and some hours later they were sighted by a pilot of an aircraft who reported their position. During the next day and night they drifted until an airborne lifeboat was dropped safely to them. This was boarded and course was set for England. Before the English coast was reached the crew were picked up by a fishing vessel just as the position was becoming extremely serious. Throughout a most trying ordeal Flt. Lt. Etchells displayed great leadership and courage and his excellent example helped greatly to maintain the morale of his crew.

Act. Flt. Lt. G. E. WHITELEY, R.A.F.V.R., No. 172 Sqn.—One night in August, 1944, Flt. Lt. Whiteley was captain and pilot of an aircraft engaged on an anti-submarine patrol. W/O. Bulley and Flt. Sgt. Ford were wireless operators in the aircraft. During the patrol a fully surfaced U-boat was seen and attacked immediately. Despite accurate fire from the submarine, Flt. Lt. Whiteley unflinchingly continued his run in and released his depth charges as his aircraft passed over the vessel. The bomber sustained severe damage and crashed into the sea. Only one dinghy was available as the aircraft sank immediately. W/O. Bulley climbed through the astral hatch when some 15 to 20 feet below the surface. He swam round, flashing a torch until he found the rest of the crew and helped them into the dinghy. Then he remained in the water, tied to the dinghy, endeavouring to keep it head to sea. When the crew were picked up, this airman had been in the water for 15 hours. During this time Flt. Sgt. Ford, who had been badly wounded, displayed great cheerfulness and was an inspiration to his companions.

Act. F/O. T. WILSON, R.A.F.V.R., No. 622 Sqn.—On a night in August, 1944, F/O. Wilson and Flt. Lt. Gillies were pilot and navigator respectively of an aircraft detailed to attack Kiel. Whilst over the target area the aircraft sustained severe damage. The cabin roof was smashed and the engineer's compartment wrecked. All the electrical equipment failed. F/O. Wilson was badly wounded. With his right arm useless and almost blinded by splinters he retained control of the aircraft and headed for home. Throughout the homeward flight, Flt. Lt. Gillies proved a tower of strength. Although deprived of the use of all his navigational equipment, which had been wrecked, he directed the course from memory, and his ability undoubtedly played a large part in the safe return of the aircraft to this country. F/O. Wilson and Flt. Lt. Gillies displayed the highest standard of gallantry and devotion to duty under most trying circumstances.

Act. Wing Cdr. D. A. GARNER, R.A.F.O., No. 166 Sqn.—This officer is engaged on his second tour of operational duty and has completed numerous sorties against a variety of targets in Northern France. He has displayed the greatest gallantry and determination in pressing home his attacks, and his example has been most inspiring. He is a very fine leader, whose exceptional skill and fine fighting spirit have been reflected in the operational efficiency of his squadron.

Sqn. Ldr. G. W. NORTHCOTT, D.F.C., R.C.A.F., No. 402 (R.C.A.F.) Sqn.—This officer has completed two tours of operational duty and throughout has set an example of skill, gallantry and devotion to duty of the highest order. In recent operations in Normandy his squadron has provided fighter cover over the beaches and convoy area, often in bad weather, and, during these missions, Sqn. Ldr. Northcott has displayed gallant and inspiring leadership. This officer has destroyed nine enemy aircraft.

Act. Sqn. Ldr. D. J. WILLIAMS, D.F.C., R.C.A.F., No. 406 Sqn.—This officer has completed a large number of sorties, including a number during which he has successfully attacked a variety of targets on the ground. In the air he has destroyed five enemy aircraft at night. He is a brave and resourceful pilot, whose fine fighting qualities were well illustrated one night in July, 1944, when he destroyed two enemy aircraft in one sortie. In the fighting his own aircraft sustained damage but he flew it safely to base in the face of extremely adverse weather. This officer is a most efficient and inspiring flight commander.

Flt. Lt. G. E. JAMESON, R.N.Z.A.F., No. 488 (N.Z.) Sqn.—This officer and F/O. Crookes have completed many sorties as pilot and observer respectively. They have displayed great skill and co-operation, qualities which were well displayed on one occasion in July, 1944, when they destroyed four aircraft in one sortie. Their devotion to duty has been unfailing.

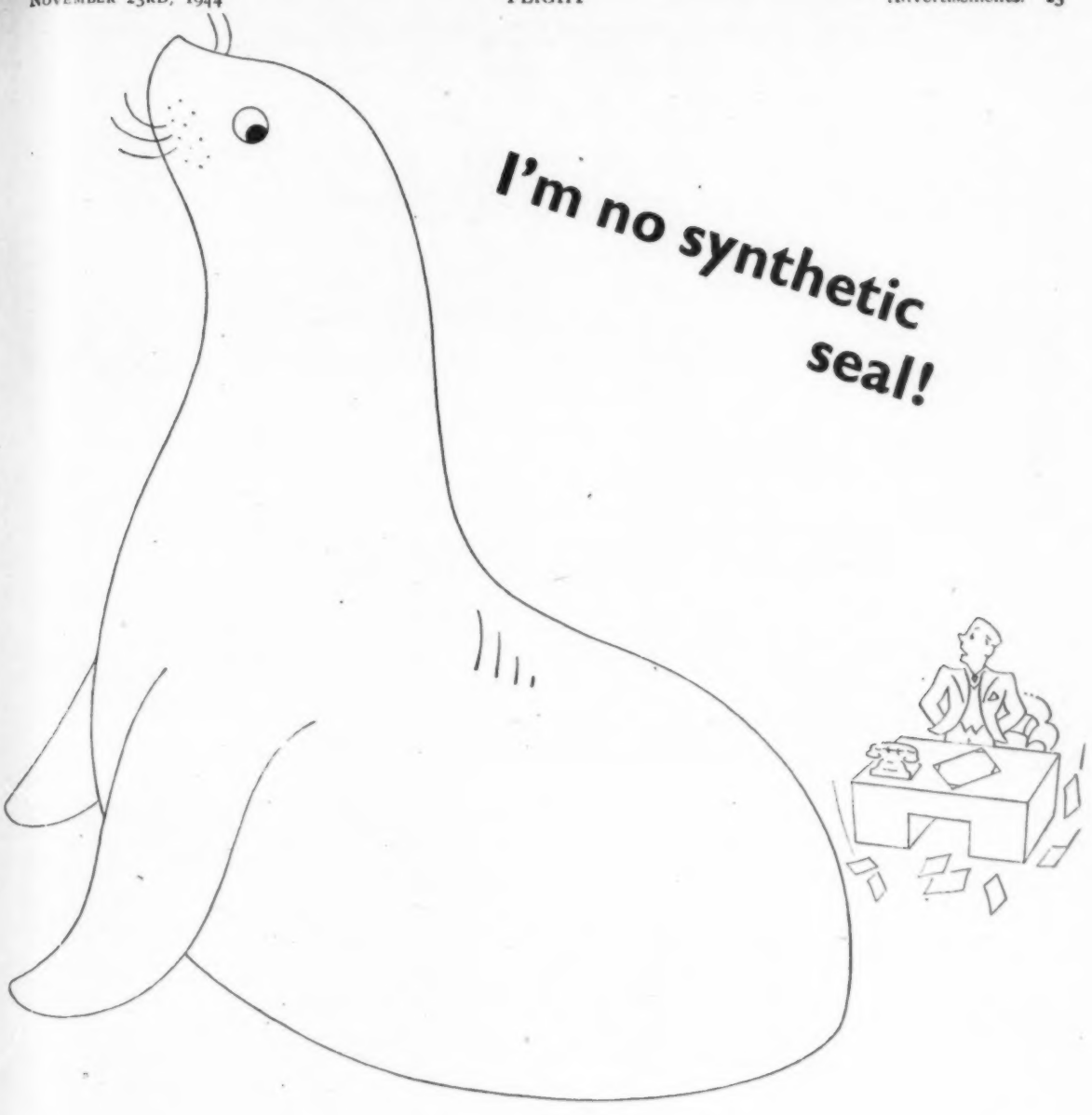
Act. Group Capt. L. C. DEANE, D.F.C., R.A.F., No. 83 Sqn.—Group Capt. Deane has completed a large number of sorties against heavily defended German targets, including attacks on Berlin five times in succession. He has at all times displayed the highest standard of courage and resolution in pressing home his attacks and has remained in the vicinity of the target for long periods, despite heavy opposition. His leadership has been of a high order.

Act. Wing Cdr. W. J. DEAS, D.F.C., R.A.F.V.R.—This officer, now on his third tour of operations, has completed a large number of sorties, many of them against dangerous and difficult targets. Throughout he has never failed to bring his missions to a successful conclusion. His leadership and determination have been an inspiration to all.

Act. Wing Cdr. G. F. GEORGESON, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since the award of the D.F.C., this officer has completed many sorties. He is a navigator of high merit, and his technical skill has contributed to a large extent to the operational successes achieved by his flight. He has set a fine example to all.

Act. Wing Cdr. F. W. THOMPSON, D.F.C., A.F.C., R.A.F.V.R., No. 44 Sqn.—Since assuming command of his squadron this officer has completed

I'm no synthetic seal!



"I suppose not, you great lump of blubber. I want a seal for my bearings, to protect them from water and dirt, and things like you."

"Oh! My mistake. You must get a SuPerfect Seal, obviously. Just fill up the Seal Questionnaire, will you?" ★

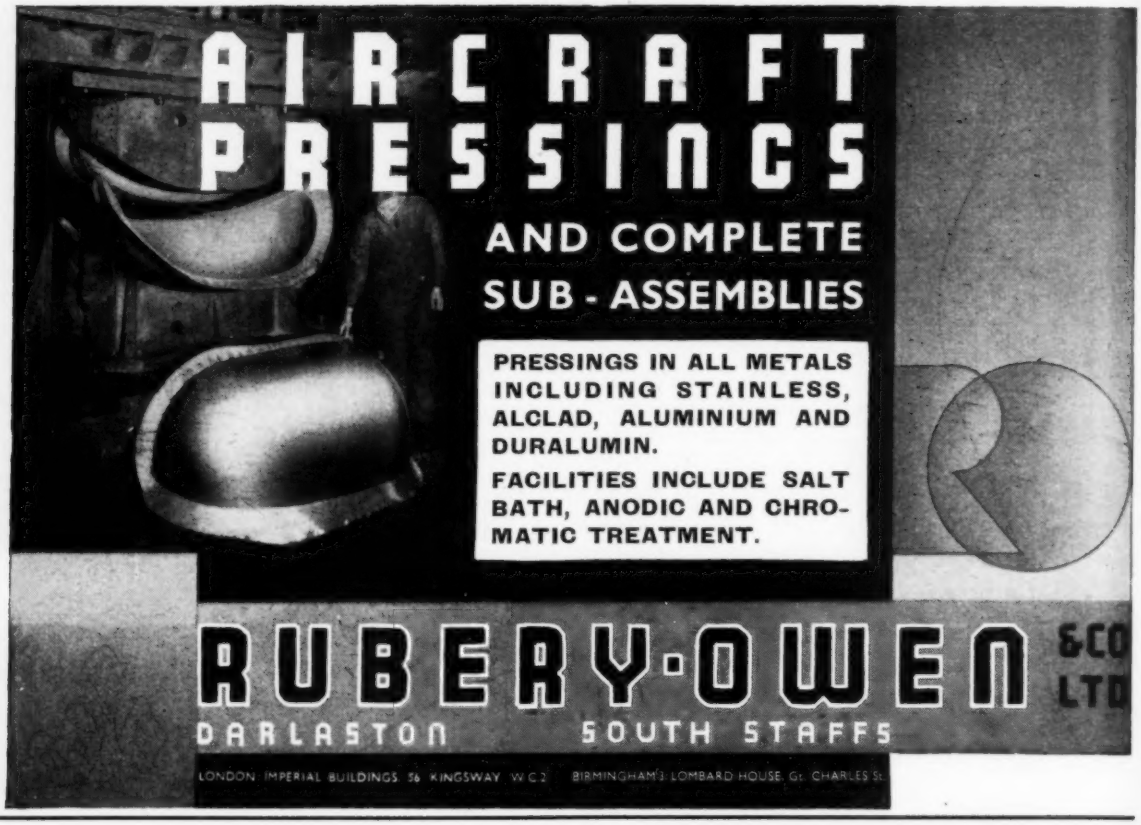
★ What is your sealing problem? Does it concern oil, water, chemicals, gas, grease? Hand it on to the specialists—send for the SuPerfect Seal Questionnaire, complete it, and we will work out the answer.

Enquiries are invited from Manufacturing and Engineering concerns

SUPERFECT

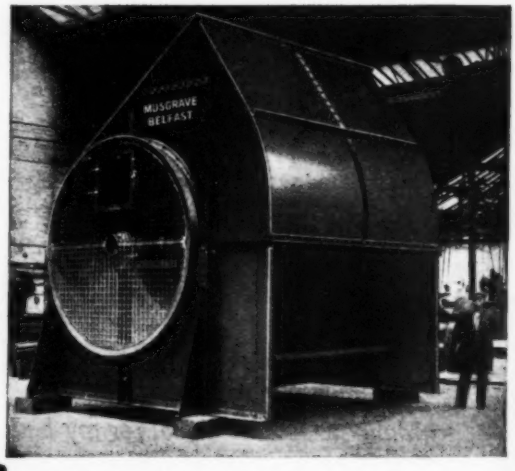
SUPER OIL SEALS & GASKETS LIMITED

BIRMINGHAM FACTORY CENTRE, KINGS NORTON, BIRMINGHAM, 30


AIRCRAFT
PRESSINGS
AND COMPLETE
SUB-ASSEMBLIES
PRESSINGS IN ALL METALS INCLUDING STAINLESS, ALCLAD, ALUMINIUM AND DURALUMIN.
FACILITIES INCLUDE SALT BATH, ANODIC AND CHROMATIC TREATMENT.
RUBERY·OWEN &CO LTD
DARLASTON SOUTH STAFFS
LONDON: IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2 BIRMINGHAM 3: LOMBARD HOUSE, Gt. CHARLES ST.

Specify "Musgrave" for all **FAN EQUIPMENT**

Designed by experts, Musgrave Plant is efficient, economical, built to give years of hard service without trouble.



The Fan illustrated is a large Musgrave "G" Type Ventilating Fan.

HEATING VENTILATION
AIR CONDITIONING
DUST AND FUMES REMOVAL
DRYING

Musgrave
and Company Limited
ASTOR HOUSE, ALDWYCH, LONDON, W.C.2

BELFAST • MANCHESTER • BRISTOL • CARDIFF • GLASGOW

numerous sorties against a variety of targets. On one occasion, en route to Stuttgart, his aircraft was hit by anti-aircraft fire, disabling one engine, which caught fire. The fire was eventually extinguished although not before considerable height had been lost. Nevertheless, displaying the determination and efficiency which has characterised his operational career, Wing Cdr. Thompson continued his mission and completed a successful attack. On the return journey a second engine gave trouble, necessitating a landing in adverse weather shortly after crossing the English Coast. By his personal example of determination, courage and enthusiasm this officer has raised the efficiency and morale of his squadron to a very high level.

Act. Sqn. Ldr. **A. H. BURTON, D.F.C.**, R.A.F.V.R., No. 90 Sqn.—This officer is now on his third tour of operations. As flight commander he has completed many sorties and has invariably displayed the utmost determination and skill to press home his attacks to a successful conclusion. His calm efficiency and unfailing devotion to duty are worthy of the highest praise.

Act. Sqn. Ldr. **H. TILSON, D.F.C., R.C.A.F.**, No. 622 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Tilson has completed many sorties. On one occasion he was detailed to attack Stuttgart. On the outward flight, when a number of miles away from his objective, an engine became unserviceable. Considerable height was lost, but Sqn. Ldr. Tilson continued his mission, flying through a heavy barrage of anti-aircraft fire. After leaving the target, a course was set for base at a low altitude and eventually a successful landing was made. This officer has invariably displayed courage and devotion to duty and has proved himself an exceptional leader.

Bar to Distinguished Flying Cross

Act. Wing Cdr. **D. F. DENNIS, D.S.O., D.F.C.**, R.A.F.V.R., No. 21 Sqn.—Wing Cdr. Dennis has commanded his squadron with marked success. One night in August he was detailed for a particularly hazardous attack on a transporter bridge across the Seine. The enemy defences in the area were extremely heavy. Disregarding the opposition this officer led his aircraft in to the attack, scoring hits with his bombs. Wing Cdr. Dennis has completed very many sorties, including numerous night attacks. His leadership, initiative and courage have been of a high order.

Act. Sqn. Ldr. **B. E. WILMOT, D.F.C.**, R.C.A.F., No. 415 (R.C.A.F.) Sqn.—Since the award of the D.F.C., Sqn. Ldr. Wilmot has completed numerous sorties against a variety of targets. On a recent operation against Brunswick, although his aircraft was attacked and severely damaged by enemy night fighters, Sqn. Ldr. Wilmot displayed great skill and determination in pressing home his attack and in bringing his damaged aircraft safely back to base. He has set a worthy example.

Flt. Lt. **G. G. POTIER, D.F.C.**, R.A.F.V.R., No. 53 Sqn.—This officer has displayed a high degree of skill, leadership and devotion to duty. He has participated in a large number of sorties, including numerous U-boat attacks, and has inflicted much damage on the enemy. Flt. Lt. Potier has set a fine example to all.

F/O. A. N. CROOKES, D.F.C., R.A.F.V.R., No. 488 (N.Z.) Sqn.—For citation see Flt. Lt. **JAMESON, D.S.O.**

Act. Sqn. Ldr. **J. F. MITCHELL, D.F.C.**, R.C.A.F., No. 83 Sqn.—Since the award of the D.F.C., this officer has participated in many further attacks on enemy targets in Western Germany and occupied territory. He has always been a cool and courageous captain. As deputy flight commander he has set a sterling example to all in the squadron.

Act. Flt. Lt. **A. J. G. VAN RASSEL, D.F.C.**, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has achieved many operational successes. He has displayed great courage in the face of danger, and his determination to press home his attacks has set an inspiring example to all members of his squadron.

Act. Flt. Lt. **G. B. TAIT, D.F.C., R.C.A.F.**, No. 109 Sqn.—Flt. Lt. Tait has taken part in many operations as a navigator. His technical skill and unfailing determination regardless of enemy opposition make this officer invaluable to his squadron.

Act. Wing Cdr. **J. N. DAVENPORT, D.S.O., D.F.C., R.A.A.F.**, No. 455 (R.A.A.F.) Sqn.—Since being awarded the D.S.O., Wing Cdr. Davenport has taken part in numerous attacks on enemy shipping. Much of the success obtained can be attributed to this officer's brilliant and courageous leadership. His outstanding ability and personal example have impressed all.

Sqn. Ldr. **E. W. TACON, D.F.C., A.F.C.**, R.A.F.O., No. 236 Sqn.—In July, 1944, this officer took part in an attack on an enemy convoy during which four ships were set on fire. By his gallant and skilful leadership, Sqn. Ldr. Tacon contributed in a large way to the success achieved. His resolute example in the face of heavy opposing fire proved greatly inspiring.

Conspicuous Gallantry Medal (Flying)

Flt. Sgt. **A. C. COLE**, R.A.F.V.R., No. 622 Sqn.—In August, 1944, W/O. Farquharson and Flt. Sgt. Cole were navigator and wireless operator respectively of an aircraft detailed to attack Stettin. On the return flight the aircraft was intercepted and severely damaged by an enemy fighter. Although seriously wounded and in great pain, W/O. Farquharson continued his navigational duties, but was finally persuaded to be removed to a rest bed, where he was given an injection of morphia. Meantime, Flt. Sgt. Cole, although injured in the thigh by a piece of shrapnel, concealed the seriousness of his wound and took over the task of navigating the aircraft back to base. The English coast was eventually crossed and a landing was made at the first available airfield. Weak from loss of blood, Flt. Sgt. Cole was on the verge of collapse and was removed to hospital. These airmen have completed many sorties, and their gallantry and devotion to duty have been of a very high order.

Distinguished Flying Cross

P/O. A. AIREY, R.A.F.V.R., No. 44 Sqn.
P/O. M. V. ALLEN, R.A.F.V.R., No. 12 Sqn.
P/O. R. P. ANDERSON, R.A.F.V.R., No. 100 Sqn.
P/O. J. C. BAKER, R.A.F.V.R.
P/O. E. R. BELBIN, R.A.F.V.R., No. 100 Sqn.
P/O. J. R. BELL, R.A.F.V.R., No. 617 Sqn.
P/O. W. J. BIBBY, R.A.F.V.R., No. 550 Sqn.
P/O. F. C. BOYD, R.A.F.V.R., No. 626 Sqn.
P/O. W. N. H. BRAWN, R.A.F.V.R., No. 550 Sqn.
P/O. F. G. BROWNINGS, R.A.F.V.R., No. 103 Sqn.
P/O. T. H. BURFORD, R.A.F.V.R., No. 625 Sqn.
P/O. J. V. CANNON, R.A.F.V.R., No. 626 Sqn.
P/O. E. F. CASEY, R.A.F.V.R., No. 626 Sqn.
P/O. A. E. CHARMAN, R.A.F.V.R., No. 101 Sqn.
P/O. D. CLARK, R.A.F.V.R., No. 428 (R.C.A.F.) Sqn.
P/O. D. W. COBDEN, R.A.F.V.R., No. 77 Sqn.
P/O. E. A. F. COLE, R.A.F.V.R., No. 101 Sqn.
P/O. J. N. COLLINS, R.A.F.V.R., No. 578 Sqn.
P/O. D. COOPER, R.A.F.V.R., No. 102 Sqn.
P/O. E. CROOK, R.A.F.V.R., No. 101 Sqn.
P/O. T. H. DAVIES, R.A.F.V.R., No. 578 Sqn.
P/O. H. L. DAWSON, R.A.F.V.R., No. 626 Sqn.
P/O. J. E. H. DEAN, R.A.F.V.R., No. 77 Sqn.
P/O. A. T. DEWAR, R.A.F., No. 115 Sqn.
P/O. A. DICKEN, R.A.F.V.R., No. 44 Sqn.
P/O. G. D. DIXON, R.A.F.V.R., No. 100 Sqn.
P/O. G. D. DOWDESWELL, R.A.F.V.R., No. 101 Sqn.
P/O. A. J. ELEY, R.A.F.V.R., No. 156 Sqn.
P/O. T. FARNWORTH, R.A.F.V.R., No. 76 Sqn.
P/O. D. W. N. FRANKLIN, R.A.F.V.R., No. 115 Sqn.
P/O. J. GAGG, R.A.F.V.R., No. 166 Sqn.
P/O. F. S. GARSIDE, R.A.F.V.R., No. 619 Sqn.
P/O. P. GERAGHTY, R.A.F.V.R., No. 102 Sqn.
P/O. K. L. GILLAM, R.A.F.V.R., No. 78 Sqn.
P/O. R. GRIEVE, R.A.F.V.R., No. 428 (R.C.A.F.) Sqn.
P/O. E. GRIMSHAW, R.A.F.V.R., No. 15 Sqn.
P/O. S. E. HAMPSON, R.A.F.V.R., No. 100 Sqn.
P/O. S. M. HICKS, R.A.F.V.R., No. 626 Sqn.
P/O. J. L. HINDLE, R.A.F.V.R., No. 640 Sqn.
P/O. J. R. HOLLANDER, R.A.F.V.R., No. 51 Sqn.
P/O. T. HUME, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
P/O. H. HOUGHTON, R.A.F.V.R., No. 76 Sqn.
P/O. C. D. JOHNSTON, R.A.F.V.R., No. 138 Sqn.
P/O. D. C. JONES, R.A.F.V.R., No. 156 Sqn.
P/O. A. E. KITCHEN, R.A.F.V.R., No. 109 Sqn.
P/O. T. W. L. LEAK, R.A.F.V.R., No. 97 Sqn.
P/O. J. T. E. LEGGE, R.A.F.V.R., No. 626 Sqn.
P/O. A. F. LOCK, R.A.F., No. 156 Sqn.
P/O. N. H. B. LUCAS, R.A.F.V.R., No. 9 Sqn. (since deceased).
P/O. A. F. MACLACHLAN, R.A.F.V.R., No. 578 Sqn.
P/O. T. MCCARTHY, R.A.F.V.R., No. 51 Sqn.
P/O. R. MCCRACKEN, R.A.F.V.R., No. 76 Sqn.
P/O. D. D. MCLEAN, R.A.F.V.R., No. 9 Sqn.
P/O. P. C. MACKENZIE, R.A.F.V.R., No. 156 Sqn.
P/O. A. G. MCQUEEN, R.A.F.V.R., No. 622 Sqn.
P/O. E. A. MANSFIELD, R.A.F.V.R., No. 115 Sqn.
P/O. W. B. MARSHALL, R.A.F.V.R., No. 156 Sqn.
P/O. J. MARSHALLSAY, R.A.F.V.R., No. 627 Sqn.
P/O. S. MASTERS, R.A.F.V.R., No. 158 Sqn.
P/O. R. MARTIN, R.A.F.V.R., No. 578 Sqn.
P/O. R. L. MARTIN, R.A.F.V.R., No. 626 Sqn.
P/O. R. W. MEREDITH, R.A.F.V.R., No. 429 (R.C.A.F.) Sqn.
Act. F/O. D. LAWRENCE, R.A.A.F., No. 138 Sqn.
Act. F/O. C. G. MILLER, R.A.A.F., No. 582 Sqn.
Act. F/O. E. SCHUMAN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. J. W. NEDWICH, R.A.A.F., No. 97 Sqn.
P/O. B. W. WEBB, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
P/O. A. I. WIGGINS, R.A.A.F., No. 166 Sqn.
W/O. G. R. BIRD, R.A.A.F., No. 77 Sqn.
W/O. M. G. CAMPBELL, R.A.A.F., No. 51 Sqn.
W/O. A. H. DREW, R.A.A.F., No. 582 Sqn.
W/O. J. P. SPARKES, R.A.A.F., No. 166 Sqn.

SERVICE AVIATION

ALLIED AIR CHIEFS ON CONTINENT: (Left to right) Rear Admiral Hj. Riiser-Larsen, C.B., C.-in-C. Norwegian Air Force; Colonel Savitch, Yugoslav Air Attaché; Colonel Van Barlekom, O.B.E., Royal Dutch Air Force Chief of Staff; Group Captain J. Schejbal, C.B.E., Czech Deputy Inspector-General; Group Captain M. Kinatos, Greek Air Attaché; Air Lieutenant Colonel Huang Pun-Young, Chinese Air Attaché; Air Commodore B. I. Kwiecinski, C.B.E., Polish Air Attaché; Air Vice-Marshal Cassimatis, United Kingdom representative, Greek Air Ministry; Colonel A. Hecksher, Brazilian Air Attaché; Air Vice-Marshal M. Izycki, A.O.C.-in-C. Polish Air Force and Air Commodore F. E. Wouters, C.B.E., M.C., Belgian Inspector-General.

SERVICE AVIATION

W/O K. C. TWEEDIE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
W/O. (now P/O.) C. K. YOUNG, R.A.A.F., No. 640 Sqn.
F/O. D. E. SMITH, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
F/O. P. F. SNELL, R.C.A.F., No. 78 Sqn.
F/O A. G. SPARK, R.C.A.F., No. 78 Sqn.
F/O. L. D. SWENERTON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O M. E. TALMAGE, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. J. S. WALLACE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
F/O. A. V. WATSON, R.C.A.F., No. 138 Sqn.
F/O. W. L. WHITE, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. J. L. WIDDIS, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O D. H. WOODLEY, R.C.A.F., No. 103 Sqn.
F/O. F. E. WOODLAND, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. R. E. WOODS, R.C.A.F., No. 51 Sqn.
Act. F/O. J. M. BOURASSA, R.C.A.F., No. 635 Sqn.
P/O. T. R. BAILEY, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
P/O. N. BANIKA, R.C.A.F., No. 578 Sqn.
P/O. M. BARTMAN, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
P/O W. J. BLACKBURN, R.C.A.F., No. 12 Sqn.
P/O. E. A. BURKE, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. J. A. CERAT, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O. G. W. CHASE, R.C.A.F., No. 103 Sqn.
P/O E. MacC. COOPER, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
P/O. A. P. CRAIN, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O. W. A. CURTIS, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
P/O. L. McL. FRASER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O R. C. FRASER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. N. A. GOULET, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O. M. A. GRACE, R.C.A.F., No. 156 Sqn.
P/O. A. H. HEGSETH, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O. J. R. HOLLAND, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
P/O S. G. HORDAL, R.C.A.F., No. 576 Sqn.
P/O. W. G. INGLEBY, R.C.A.F., No. 578 Sqn.
P/O. G. S. JAMES, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O A. B. JOHNSON, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
P/O. F. E. KEEGAN, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
P/O. G. L. W. LAUNLY, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. B. H. LEFURGEY, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
P/O. J. A. MCCRORY, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O. D. W. MCIVOR, R.C.A.F., No. 576 Sqn.
P/O. L. L. MITCHELL, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O. J. M. MONAHAN, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
P/O A. A. MOORE, R.C.A.F., No. 103 Sqn.
P/O. G. H. MORRIS, R.C.A.F., No. 578 Sqn.
P/O. J. NOWAZEK, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
P/O. W. J. PEARSON, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
P/O S. W. POSNER, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
P/O. F. W. PRENTICE, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
P/O. J. J. RABCHAK, R.C.A.F., No. 103 Sqn.
P/O. G. A. RICE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O A. J. ROSS, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. A. E. STYLES, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. N. L. THOMPSON, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
W/O. R. P. ALLEN, R.C.A.F., No. 9 Sqn.
W/O. (now P/O.) R. M. GUNDY, R.C.A.F., No. 101 Sqn.
W/O W. J. HOPE, R.C.A.F., No. 90 Sqn.
W/O. L. E. JONES, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
W/O1 (now P/O.) R. M. MCCUNN, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
W/O (now P/O.) K. G. WILDE, R.C.A.F., No. 100 Sqn.
W/O.2 G. W. ANNESLEY, R.C.A.F., No. 626 Sqn.
W/O.2 E. BANNOFF, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
W/O. G. A. C. EBY, R.C.A.F., No. 101 Sqn.
W/O.2 C. R. THRASHER, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
W/O.2 B. J. F. X. VANIER, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
W/O.2 R. E. ZWICKER, R.C.A.F., No. 138 Sqn.

Distinguished Flying Medal

Flt. Sgt. J. C. SELWYN, R.A.F.V.R., No. 103 Sqn.
Flt. Sgt. W. W. E. SLATER, R.A.F.V.R., No. 626 Sq.
Flt. Sgt. J. McG. SMITH, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. W. SNEDDON, R.A.F.V.R., No. 15 Sqn.
Flt. Sgt. J. R. SPARK, R.A.F.V.R., No. 103 Sqn.
Flt. Sgt. (now P/O) M. J. STANCER, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. F. W. SWEET, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. P. A. TAYLOR, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. F. H. TAYLOR, R.A.F.V.R., No. 100 Sqn.
Flt. Sgt. T. TAYLOR, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. K. W. TAYLOR, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. J. F. VAISSIERE, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. H. J. VINDEN, R.A.F.V.R., No. 166 Sqn.
Flt Sgt. C. A. C. WANBON, R.A.F.V.R., No. 78 Sqn.
Flt. Sgt. T. WATERS, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. A. WILSON, R.A.F.V.R., No. 44 Sqn.
Sgt. K. APPLEYARD, R.A.F.V.R., No. 12 Sqn.
Sgt. A. E. BECKETT, R.A.F.V.R., No. 626 Sqn.
Sgt. G. BOOTH, R.A.F.V.R., No. 51 Sqn.
Sgt. H. D. CAMPBELL, R.A.F.V.R., No. 619 Sqn.
Sgt. H. L. CARR, R.A.F.V.R., No. 101 Sqn.
Sgt. K. C. DACK, R.A.F.V.R., No. 101 Sqn.
Sgt. V. D. EDWARDS, R.A.F.V.R., No. 12 Sqn.
Sgt. F. D. GLEN, R.A.F.V.R., No. 626 Sqn.
Sgt. A. J. GRIFFEE, R.A.F.V.R., No. 619 Sqn.
Sgt. B. McC. HAMILTON, R.A.F.V.R., No. 51 Sqn.
Sgt R. D. HAWTHORNE, R.A.F.V.R., No. 78 Sqn.
Sgt. T. G. HOLT, R.A.F.V.R., No. 101 Sqn.
Sgt. A. J. MOORE, R.A.F.V.R., No. 101 Sqn.
Sgt. R. MURRAY, R.A.F.V.R., No. 578 Sqn.
Sgt. D. PARKINSON, R.A.F.V.R., No. 51 Sqn.
Sgt. R. D. PAYNE, R.A.F.V.R., No. 51 Sqn.
Sgt. S. V. PEARCE, R.A.F.V.R., No. 51 Sqn.
Sgt. A. E. RICE, R.A.F.V.R., No. 158 Sqn.
Sgt. A. C. SEAMAN, R.A.F.V.R., No. 166 Sqn.
Sgt. B. E. G. SOPER, R.A.F.V.R., No. 626 Sqn.
Sgt. J. STARK, R.A.F.V.R., No. 78 Sqn.
Sgt. L. P. SWALES, R.A.F.V.R., No. 101 Sqn.
Sgt J. A. WADIA, R.A.F.V.R., No. 578 Sqn.
Sgt. E. G. WELSH, R.A.F.V.R., No. 101 Sqn.
Sgt. R. P. W. WOODWARD, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. H. C. SLOAN, R.C.A.F., No. 578 Sqn.
Flt. Sgt. (now P/O.) H. J. VENN, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
Flt. Sgt. G. H. WIDDIS, R.C.A.F., No. 97 Sqn.
Sgt. E. W. CHAPPELL, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt Sgt J. E. BALL, R.A.F.V.R., No. 76 Sqn.
Flt Sgt. A. BALLANDS, R.A.F.V.R., No. 692 Sqn.
Flt. Sgt. W. F. YATES, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. W. E. BENTLEY, R.A.F., No. 622 Sqn.
Flt. Sgt W. J. BEESLEY, R.A.F., No. 50 Sqn.
Flt. Sgt. J. G. BODEN, R.A.F.V.R., No. 115 Sqn.
Flt Sgt. F. R. J. RICHARDSON, R.A.F.V.R., No. 140 Sqn.
Flt. Sgt. T. H. COX, R.A.F.V.R., No. 620 Sqn.
Flt. Sgt. J. W. C. FORD, R.A.F.V.R., No. 172 Sqn. (For citation see Flt. Lt. Whiteley, D.S.O.)

AIRBORNE OLD GUARD: Two Chelsea pensioners recently flew to Brussels to take part in the United Services Festival of Remembrance. (Left to right) F/O. H. Weber, Sgt. P. Keating, Flt. Lt. A. L. Duncal and 71 years old Colour-Sgt. F. Lee.

Army Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in Italy:—

Military Cross

Lt. G. L. PEARSON, Army Air Corps.

Military Medal

Cpl. (Act. Sgt.) W. D. JONES, Army Air Corps.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in North West Europe:—

Distinguished Flying Cross

Capt. (temp. Maj.) R. R. COBLEY, Royal Regiment of Artillery.
Lt. (Act. Capt.) G. H. I. JONES, Royal Regiment of Artillery.
Lt. (temp. Capt.) I. G. NEILSON, Royal Regiment of Artillery

Distinguished Flying Medal

S/Sgt. S. G. BONE, Army Air Corps.
S/Sgt. D. F. KERR, Army Air Corps.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in the field:—

Military Cross

Capt. (temp. Maj.) R. D. C. MCCALL, Army Air Corps.

The Canadian Army

THE KING has been graciously pleased to approve the following award in recognition of gallant and distinguished services in the field:—

Military Medal

Cpl. (Act. Sgt.) W. F. MINARD, 1st Canadian Parachute Battalion.

Far East

THE KING has been graciously pleased, on the advice of His Majesty's Australian Ministers, to give orders for the following awards in recognition of conspicuous service in operations against the Japanese:

O.B.E. (Mil.)

Act. Group Capt. B. P. MACFARLAN, R.A.A.F.
Wing Cdr. F. W. SEXTON, R.A.A.F.
Sqn. Ldr. T. S. CARLYON, R.A.A.F.

M.B.E. (Mil.)

Flt. Lt. J. G. SHELTON, R.A.A.F.
F/O. L. W. G. BELL, R.A.A.F.
W/O. A. S. ROSS, R.A.A.F.

Distinguished Flying Cross

Wing Cdr. K. S. HENNECK, R.A.A.F.
Wing Cdr. F. W. R. MANN, R.A.A.F.
Wing Cdr. C. F. THOMPSON, R.A.A.F.
Sqn. Ldr. J. G. MORTON, R.A.A.F.
Sqn. Ldr. C. W. MUNRO, R.A.A.F.
Flt. Lt. N. J. LENNON, R.A.A.F.
Flt. Lt. G. H. N. SHIELLS, R.A.A.F.
Flt. Lt. C. E. TUTTLEBY, A.F.M., R.A.A.F.
Flt. Lt. C. W. WRAY, R.A.A.F.
F/O. J. A. T. HODGKINSON, R.A.A.F.
Flt. Lt. W. MCRAE-WOOD, R.A.A.F.
F/O. E. M. MARRON, R.A.A.F.
F/O. J. PURVES, R.A.A.F.
F/O. W. G. ROBERTSON, R.A.A.F.
F/O. J. F. SPEARS, R.A.A.F.
F/O. B. M. WARDEN, R.A.A.F.

Air Force Cross

Sqn. Ldr. I. J. G. CRAWFORD, R.A.A.F.
F/O. G. P. LOBWEIN, R.A.A.F.
F/O. A. C. LONGMORE, R.A.A.F.

Distinguished Flying Medal

Flt. Sgt. (now W/O.) C. V. GOLLAN, R.A.A.F.
Flt. Sgt. (now P/O.) E. C. HOOKER, R.A.A.F.
Flt. Sgt. G. J. PING, R.A.A.F.

Air Force Medal

Flt. Sgt. T. G. PADGETT, R.A.A.F.

B.E.M. (Mil.)

Flt. Sgt. [illegible] J. MILLER, R.A.A.F.
Flt. Sgt. [illegible] W. MORRISON, R.A.A.F.

THE KING has been graciously pleased to approve the following awards to members of the Royal New Zealand Air Force in recognition of gallantry and devotion to duty in the execution of air operations in the South-West Pacific area:—

Distinguished Flying Cross

Sqn. Ldr. T. J. MACL. DE LANGE, No. 25 (N.Z.) Sqn.
Act. Sqn. Ldr. H. N. JAMES, No. 30 (N.Z.) Sqn.
Flt. Lt. H. C. CARTER, No. 3 (N.Z.) Sqn.
Flt. Lt. R. F. HOYLE, No. 3 (N.Z.) Sqn.
Act. Flt. Lt. A. G. STANLEY, No. 20 (N.Z.) Sqn.

Distinguished Flying Medal

Flt. Sgt. J. EDWARDS, No. 17 (N.Z.) Sqn.
Flt. Sgt. (now F/O.) I. M. PAGE, No. 3 (N.Z.) Sqn

THE KING has been graciously pleased to approve the following award in recognition of brave conduct:—

Military Medal

Cpl. L. V. YATES, R.N.Z.A.F.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy in the South-West Pacific area :—

Distinguished Flying Cross

Flt. Lt. R. S. McHARDY.
Sqn. Ldr. J. S. LEE, R.A.A.F.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations, conferred upon the officers indicated, in recognition of valuable services rendered in connection with the war :—

Conferred by the President of the United States of America

Distinguished Service Medal

Air Vice-Marshal R. V. GODDARD, C.B., C.B.E., R.A.F.

Distinguished Flying Cross

Air Vice-Marshal L. N. HOLLINGHURST, C.B., C.B.E., D.F.C., R.A.F.
Group Capt. G. K. GILROY, D.S.O., D.F.C., A.A.F.
Group Capt. P. H. HUGO, D.S.O., D.F.C., R.A.F.
Act. Wing Cdr. A. D. J. LOVELL, D.S.O., D.F.C., R.A.F.O.
Flt. Lt. A. P. SKINNER, R.A.F.
P.O. E. S. DOHERTY, R.N.Z.A.F.
P.O. H. D. HAMPTON, R.N.Z.A.F.

Conferred by His Majesty the King of Norway

Chevalier of the Order of St. Olav (First Class)

Act. Sqn. Ldr. C. K. SQUIRES, R.A.F.V.R.

Roll of Honour

Casualty Communiqué No. 444.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 76 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. H. I. Ferguson; Sqn. Ldr. J. L. Griffith; Flt. Sgt. A. R. Hack; Flt. Sgt. H. J. Somerville.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. W. Allen; Sgt. R. Curle; Sgt. A. D. Mackay; Sgt. F. R. Middleton; Flt. Sgt. L. T. Needham; F/O. A. J. Palmer; Sgt. N. F. A. Whyte; Flt. Lt. P. A. S. Woodwark.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. S. R. Adams; Sgt. J. E. Bacon; P/O. S. J. Bell; Sgt. H. J. Bird; Sgt. E. J. Boardman; Flt. Sgt. A. C. Branch, D.F.M.; Sgt. A. H. Brownlie; Sgt. W. G. Cane; Sgt. E. Carter; Act. Sqn. Ldr. A. G. A. Cochrane, D.F.C.; F/O. M. J. Coombe; Sgt. L. Cross; Sgt. G. W. Dillnutt; Sgt. J. Evans; Sgt. A. R. Flatters; Flt. Sgt. C. W. Foster; F/O. J. H. L. German; Flt. Sgt. K. Gore; Sgt. J. Grainger; W/O. S. G. W. Hall; Sgt. G. H. Kaye; Sgt. B. D. S. Lovell; Sgt. J. Manderson; Sgt. J. Maxton; F/O. R. Morrish; Sgt. T. T. O'Leary; Flt. Sgt. F. J. D. Prebble; Act. W/O. J. T. C. Rhodes; P/O. I. L. Richards; Sgt. L. W. Searle; Sgt. A. E. Shaw; Sgt. H. Sykes; Flt. Sgt. R. L. Taylor; Sgt. B. Thorpe; Flt. Sgt. D. M. Watson; Sgt. G. M. Weighell; Sgt. F. E. White; Sgt. D. S. Wilson; P/O. A. G. Witt; Flt. Lt. W. G. Wood; F/O. P. M. Wooldridge; Act. Flt. Lt. K. R. Yates.

WOUNDED OR INJURED IN ACTION.—Sgt. W. Clyde; Sgt. R. A. Powell; Act F/O. H. J. West.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. C. Speckman.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. A. Barrett; Act. Sqn. Ldr. E. N. Bunting, D.F.C.; Sgt. R. A. Duffield; Sgt. K. E. Gronow; W/O. K. M. Hopley; Sgt. T. J. Simpson; F/O. E. Spedding; Flt. Lt. C. A. Whyatt.

MISSING.—F/O. J. P. Alcock; Flt. Sgt. J. W. Aldridge; F/O. J. Allinson; Act. F/O. R. Armstrong; Flt. Sgt. R. Ashworth; W/O. A. P. Baines; Sgt. A. Barker; W/O. K. J. Bettles; Act. Flt. Lt. R. W. Beveridge; Sgt. J. Birtles; Sgt. A. R. Braine; Sgt. R. H. Brewer; Flt. Sgt. F. G. C. Brown; P/O. W. F. Bunting; Act. Sqn. Ldr. V. G. F. Coleman; Sgt. T. Collins; Sgt. D. Corris; Flt. Sgt. F. J. Court; Sgt. E. J. Courtenay; Flt. Sgt. D. Craggs; Sgt. A. Craven; Sgt. G. J. Crawley; Sgt. A. M. B. Cutting; Sgt. R. G. Dean; Sgt. W. I. Dransfield; Flt. Sgt. W. Edmondson; Sgt. R. E. Elliman; Air Cdr. I. J. Fitch; Sgt. K. E. Gilson; Sgt. A. E. J. Goddard; Sgt. R. Goodacre; Act. Flt. Lt. A. E. Grubb; Flt. Sgt. F. E. Hennessy; Flt. Sgt. H. J. Hiscox; Sgt. N. J. Hobbs; Flt. Sgt. G. E. Holland; Flt. Sgt. A. A. Holmwood; Flt. Sgt. E. G. Hopkins; Flt. Sgt. R. I. Hyslop; Act. Flt. Lt. J. G. Irwin; Flt. Sgt. F. S. Jones; F/O. R. Jones; Sgt. K. D. Kibbey; Sgt. G. Kirkby; Sgt. H. C. Kneil; Sgt. R. Lane; Sgt. R. S. Lang; F/O. A. E. Lawless; Sgt. H. Lees; Flt. Sgt. R. C. L. Lewis; Sgt. R. Leyland; Flt. Lt. K. H. Loder; Sgt. M. E. T. Macrae; Flt. Sgt. W. C. McIntosh; Act. F/O. D. W. McKechnie; F/O. J. Maher; Flt. Lt. D. S. Margach, D.F.C.; Sgt. J. H. Marler; Act. Flt. Lt. M. I. Massy; Flt. Sgt. J. J. Mather; Sgt. R. D. Mercer; Sgt. E. A. Miller; F/O. E. R. Mills; Flt. Lt. B. Moorhead, D.F.C.; Sgt. G. H. Nairn; Sgt. J. T. Nixon; Flt. Sgt. S. Nunwick; Sgt. E. Ord; Sgt. G. T. Osborne; Act. Flt. Lt. A. J. Page; Sgt. E. W. Polson; Sgt. E. L. Price; Sgt. W. A. Roberts; Sgt. G. F. Robinson; Flt. Sgt. C. Shaw; P/O. R. M. Simpson; P/O. R. H. Simson; Sgt. R. G. Sloman; F/O. A. A. Smailes; Sgt. C. S. Smith; Sgt. J. D. Smith; Flt. Sgt. W. Smith; Flt. Sgt. C. F. Spencer; Sgt. N. Stalker; Sgt. E. W. Starling; Flt. Sgt. G. Tate; Flt. Sgt. G. D. Taylor; P/O. R. Taylor; Sgt. W. Taylor; Sgt. C. E. W. E. W. Thomas; Sgt. D. J. Thomas; Flt. Sgt. F. C. V. Tuck; Sgt. R. Turner; Flt. Sgt. F. A. C. Varrall; F/O. E. Vierow; Sgt. F. S. Vinecombe; F/O. P. Vogt; W/O. W. Waldron; Flt. Sgt. G. A. Walker; Flt. Sgt. R. J. Ward-Barrett; Sgt. F. R. W. Waters; Sgt. J. Watkinson; Sgt. G. F. Watmough; Flt. Lt. W. D. St. C. Weeks; P/O. A. West; Flt. Sgt. F. Wharam; Sgt. J. Whitfield; Flt. Sgt. T. Whiton; Sgt. B. F. W. Wilkinson; Sgt. R. A. Williams; Flt. Sgt. J. L. Wilson; Sgt. E. A. Wood; Sgt. C. W. Woods; Flt. Sgt. F. O. Worrall; F/O. A. E. Wraight; Flt. Sgt. D. W. Wright; Sgt. W. J. C. Wylie.

KILLED ON ACTIVE SERVICE.—F/O. A. H. Birnie; Sgt. N. J. Brightwell; L.A/C. C. T. Davey; Wing Cdr. J. S. Dunlevie; Cpl. D. Emmerson; A/C.2 H. L. Evans; Sgt. S. A. Findlater; L.A/C. G. L. Freak; L.A/C. A. M. A. Goddard; A/C.2 J. Harris; Flt. Sgt. P. A. Jacobs; Flt. Sgt. J. Jones; Sgt. J. Kirk; Sgt. P. R. C. Lapsley; W/O. B. R. Lucas; P/O. N. H. B. Lucas; F/O. I. S. Macmillan; L.A/C. C. E. Moore; L.A/C. F. Moore; L.A/C. B. R. Morris; F/O. J. Naylor; Sgt. E. H. Peers; Sgt. A. G. Pring; F/O. J. O. Scott; A/C.1 S. Sharp; Sgt. D. L. S. Shircore; F/O. A. Sunter; A/C.1 A. D. Thomas; F/O. M. Williamson; A/C.1 D. C. Wilson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. D. Durward; P/O. W. J. Halfpenny; Sgt. J. Hodge; Sgt. A. F. Peart; Sgt. J. Rae; Sgt. P. Seager; F/O. H. G. Waugh.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. C. Bangs; Sgt. W. Gordon; Sgt. A. Holloway; Sgt. A. J. F. May.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. C. T. Baker; A/C.1 R. E. Carratt; Cpl. R. W. H. Ealey; A/C.2 H. G. Gadsen; A/C.2 J. Hobson; L.A/C. A. E. Lalley; A/C.1 E. Lee; L.A/C. J. McKenna; A/C.2 R. C. Mountain; A/C.1 J. C. Nightingale; A/C.1 L. Patterson; L.A/C. J. Sutton; L.A/C. A. E. Trevillion; A/C.1 L. D. Winchester.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. J. S. Clyde; P/O. R. K. Crowther; A/C.2 H. Forbes; L.A/C. R. H. Pritchard; L.A/C. N. Wootton.

DIED ON ACTIVE SERVICE.—A/C.2 R. H. Anning; Sqn. Ldr. J. Barry; Sqn. Ldr. D. W. A. Barton; A/C.2 W. J. Bint; L.A/C. S. J. N. Bligh; L.A/C. R. E. Coates; A/C.1 J. Docherty; L.A/C. G. E. Drain; Sgt. C. W. Evans; W/O. S. B. Evans; Cpl. B. Fahy; A/C.1 R. James; A/C.2 J. R. Matan; A/C.1 T. W. Matley; A/C.1 G. A. Russell; A/C.1 E. Wilkinson.

LADIES TO LUNCH : An R.A.F. sergeant of 2nd T.A.F. shares his rations with the Dutch.

Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C/W.1 E. R. Wardley.

Royal Australian Air Force

KILLED IN ACTION.—P/O. K. C. Kinross.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. E. D. Richards; Flt. Sgt. D. R. G. Taskis.

WOUNDED OR INJURED IN ACTION.—F/O. H. R. Hoare.

MISSING, BELIEVED KILLED IN ACTION.—Act. Sqn. Ldr. W. W. B. Gale; Flt. Sgt. N. E. Marsh.

MISSING.—P/O. A. J. Duncan; Flt. Sgt. F. E. Fischer; W/O. N. F. Gelder; Flt. Sgt. M. W. Harrison; F/O. J. P. Hodges; Flt. Sgt. M. J. Nolan; Flt. Sgt. B. Reece; P/O. R. R. Smith; Act. F/O. J. A. H. Wilkinson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. D. B. Barry; Sgt. E. H. Beatson; Flt. Sgt. R. K. Bolger; Flt. Sgt. A. J. Grigg; Flt. Sgt. J. J. Manners; Flt. Sgt. J. H. Normyle; Flt. Sgt. E. W. O'Dwyer; Sgt. H. A. Smyth; Flt. Sgt. F. L. Stephens; F/O. J. P. Waters.

DIED ON ACTIVE SERVICE.—Sgt. M. D. Stewart.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. R. Gardiner, D.F.C.; W/O. J. G. S. Kavanaugh; F/O. G. H. Kay; F/O. W. J. Lawrence; Flt. Lt. H. K. Lefroy; Flt. Sgt. F. C. McCubbin; Sgt. A. Mitchell; Flt. Sgt. G. Molnar; P/O. J. G. O'Dell; F/O. I. Schilansky; P/O. H. V. Stinson.

WOUNDED OR INJURED IN ACTION.—F/O. C. B. Witt.

MISSING.—F/O. W. G. Baird; Flt. Sgt. H. R. Brewer; Sgt. J. P. A. Gauthier; P/O. W. C. Gay; Sgt. W. R. Gibson; Sgt. W. Gracie; Flt. Sgt. L. T. Grenon; F/O. J. D. Harvie; W/O. L. F. Head; F/O. S. G. Hetherington; Sgt. D. High; F/O. G. R. Hodgson; W/O. F. W. Hood; Flt. Sgt. T. C. Jenkins; Flt. Sgt. W. R. Little; W/O. R. T. W. Longley; Flt. Sgt. W. R. Moore; F/O. J. E. Prudham; Sgt. A. E. Roe; F/O. P. Scullion; F/O. J. A. Smith; P/O. S. J. Swartz; W/O. J. W. Weyers; P/O. D. F. Wilson; Sgt. W. H. Winder; Flt. Lt. B. Yunker.

KILLED ON ACTIVE SERVICE.—P/O. J. F. MacDonald; P/O. H. A. McC. McKell; F/O. A. A. McKiggan; F/O. W. H. Skelton.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. H. Judd.

MISSING, BELIEVED KILLED IN ACTION.—Act. F/O. J. D. O'Driscoll; Flt. Sgt. D. R. Pepper; Flt. Sgt. P. N. Vercoe.

MISSING.—P/O. N. D. Davidson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. B. McAuley; Flt. Sgt. R. H. T. Martin; Flt. Sgt. D. Shaw; F/O. J. G. Webb.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Capt. G. F. Kaufman, D.F.C.

MISSING.—Maj. D. H. Barlow; W/O. R. Deitch; Lt. H. Dutton; Lt. J. A. Ferreira; Lt. J. Grobler; 2/Lt. I. A. Mackenzie; W/O. B. Taylor.

KILLED ON ACTIVE SERVICE.—2/Lt. S. H. E. Capstick-Dale.

DIED ON ACTIVE SERVICE.—Air Mech. N. G. Dukas; Air Mech. T. J. Kruger.

SERVICE AVIATION

Casualty Communiqué No. 445

Of the names in this list 81 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. A. Birkett; P/O. J. D Clapperton; F/O. G. S. Corry; Sgt. W. B. Dobinson; Act. Sqn. Ldr. Lord D. Douglas-Hamilton; F/O. P. E. Gatehouse, D.F.M.; Sgt. S. S. C Green; F/O. H. W. Hoskins; Sgt. B. J. Monsey; Sgt. I. R. S. Paris; Flt. Lt. A. F. Pavey; Sgt. C. J. Sexton; F/O. E. G. Strawson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. R. Brown; W/O. J. F. Craig, D.F.M.; Flt. Sgt. R. A. Creek; Sgt. C. Kershaw; Sgt. A. C. Leitch; Sgt. T. R. Miller; Sgt. H. R. Wilson; Sqn. Ldr. C. S. F. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. F. G. Andrews; Sgt. G. A. Angwin; Flt. Sgt. H. S. Bennett; Flt. Sgt. R. S. Bennett; Flt. Sgt. I. C. R. Bowden; Sgt. F. W. Bundy; Act. Sqn. Ldr. Count F. F. Colloredo-Mansfield, D.F.C.; Sgt. J. F. Croxall; Sgt. W. Dowson; F/O. M. P. Dunkerley; Act. Flt. Lt. L. W. D. Fagan, D.F.C.; Sgt. A. G. Fisher; Flt. Sgt. J. Foley; Flt. Sgt. A. F. Fry; Sgt. W. L. Fulton; Sgt. E. Graham; Sgt. L. Grimwood; Flt. Sgt. E. Gwynne; Sgt. T. J. Hall; P/O. R. S. Haney; Sgt. R. E. Harnett; Flt. Sgt. W. H. Hedley; Flt. Sgt. A. Hodgkinson; Sgt. I. Holbrook; F/O. I. R. Hyde; P/O. C. Larnach; P/O. P. A. Lee; Sgt. F. N. MacAuley; Flt. Lt. C. A. McGaw; Sgt. J. C. MacLean; Flt. Sgt. T. A. Martin; F/O. W. F. Mellor; P/O. K. P. Mills; Sgt. E. Parker; Sgt. E. C. Pocknell; F/O. S. Potts; Sgt. R. S. Sitch; Sgt. P. L. Smith; Sgt. A. B. Springett; Sgt. R. J. Thomas; Sgt. D. L. Thornley; P/O. R. A. Thornton; Sgt. R. Thorogood; Sgt. E. A. Topham; P/O. W. T. Whitmore; Sgt. M. S. Williams; Sgt. E. B. Woodrow.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. R. K. Dean; Sgt. R. J. Murfitt; F/O. R. H. Reeve; Sgt. D. Smith; Sgt. C. W. Stevenson; Flt. Sgt. M. J. Webb.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. P. J. Palmer.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. W. McCulloch.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. J. A. Blair; W/O. H. S. Cruttenden; F/O. J. Dunn, D.F.M.; Flt. Sgt. C. A. Peatey; Flt. Sgt. T. Pye; Flt. Sgt. R. H. Spencer.

MISSING.—Sgt. A. H. Allison; Sgt. J. Armstrong; Sgt. A. Ashby; Sgt. V. J. Badger; Sgt. W. J. S. Ballard; Flt. Sgt. W. S. Bancroft; Sgt. J. F. McD. Barson; F/O. H. S. W. Blaber; Sgt. R. A. O. Blanchard; Sgt. J. J. Blundell; Flt. Sgt. W. Brady; Sgt. A. J. Bramble; Flt. Sgt. F. H. A. Braybrooke; Act. F/O. W J. F. Buchanan; Sgt. R. E. Buzza; Sgt. D. J. S. Clarke; W/O. R. O. Clee; W/O. E. B. Coleman; Sgt. F. J. Collins; Sgt. S. Cottam; Sgt. R. Craig; Sgt. C. J. Crane; Sgt. F. D. Crawford; F/O. D. L. Davies, D.F.C.; Sgt. W. J. B. Doughty; P/O. H. J. Douglas; Sgt. H. K. Dove; W/O. A. Dyer; Sgt. J. S. Eastham; Act. Sqn. Ldr. R. K. Eggins; F/O. L. H. Ellerker; Sgt. B. S. W. Elliott; Sqn. Ldr. L. D. Emblem; Sgt. J. G. F. Evans; F/O. J. D. Farrar; Sgt. F. W. Fisher; Sgt. J. Fitzpatrick; Sgt. A. B. Galloway; Sgt. K. Gaythorpe; Act. Wing Cdr. G. F. Georgeson, D.F.C.; Flt. Lt. J. Gilmour; Sgt. E. Greenwood; Flt. Sgt. W. E. Griffiths; Flt. Sgt. J. Hands; Flt. Sgt. J. C. Harold; Sgt. J. Harper; F/O. A. Harrison; Sgt. T. S. Higgott; F/O. A. W. Hillyer; Sgt. T. Holmes; Sgt. R. F. Howell; Sgt. J. N. Howie; P/O. B. O. Hunt; Sqn. Ldr. R. S. Jephson; Flt. Lt. A. Johson; Sgt. H. Jones; Flt. Sgt. E. W. Julier; Flt. Lt. F. J. Kemp; Sgt. H. H. Kidd; Sgt. J. Kilgour; Flt. Sgt. P. M. Kitto; Sgt. T. G. Little; F/O. E. R. Lyon; Sgt. R. D. McAdam; Flt. Sgt. R. McElroy; F/O. J. R. McGeorge; Sgt. M. McKenzie; P/O. J. McLaren; Sgt. J. Madden; Sgt. W. H. Maltman; Act. Flt. Lt. F. A. Marden, D.F.C.; Sgt. J. McB. Meaney; Sgt. J. Melville; F/O. R. E. Monk; Sgt. J. M. Moore; Sgt. E. L. Morter; F/O. B. Murray; Sgt. J. Murray; Sgt. R. W. Nanson; Flt. Sgt. J. F. Neilson; Sgt. J. Norman; Sgt. L. T. J. Page; P/O. E. A. Parker; P/O. H. Parrott; Sgt. D. F. Paton; F/O. J. W. Patterson; F/O. B. L. Peyton; F/O. C. R. Phillips; Sgt. G. E. Phillipson; F/O. D. Pickard; Sgt. G. W. Picker; W/O J. D. Pincus; Sgt. R. J. Price; F/O. A. G. Reed; Sgt. J. Rhodes; P/O. P. E. Rushton; P/O. G. J. Scuffins; Sgt. E. Shackleton; Sgt. A. G. Shayler; F/O. S. K. Shrives; Flt. Sgt. G. H. Sims; Act. F/O. B. T. Singleton; Sgt. D. C. G. Spite; Sgt. H. L. Stephens; Sgt. G. Taylor; W/O. L. Tommie; Sgt. W. Watkins; Sgt. K. E. Welsh; Sgt. J. D. White; Flt. Sgt. R. J. Wilkinson; F/O. W. D. Wilson; Sgt. W. T. Woodhouse; F/O. S. P. Wright.

KILLED ON ACTIVE SERVICE.—Sgt. R. T. Ankers; Sgt. W. G. Ashley; Sgt. T. Aspin; F/O. F. G. Barbour; Flt. Sgt. S. Brown; Flt. Sgt. E. R. Cramp; Sgt. J. A. Edmonds; Sgt. H. A. Foster; Sgt. C. Gidman; F/O. J. K. Heaton; Flt. Lt. L. E. McAdam, D.F.M.; Sgt. F. Musgrave; Sgt. A. G. Porter; P/O. D. C. Preston; F/O. R. J. Taylor; W/O. J. R. West; Sgt. F. C. White.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. J. R. Harnwell; F/O. L. Jackson; Flt. Lt. W. McCarroll; Flt. Lt. J. A. Puttock; Sgt. G. R. S. Riddell; Sgt. S. A. Spencer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. C. Bishop; Sgt. S. Cossey; Sgt. A. S. D. Dobie; Sgt. W. K. Fraser.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. F. H. C. Horsburgh; Sgt. R. C. Roberts.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. E. T. Pratt.

DIED ON ACTIVE SERVICE.—L.A/C. O. E. Hughes; Cpl. J. R. Jones; L.A/C. C. R. Lambert; Flt. Sgt. R. C. W. MacGregor; A/C.2 E. G. Norwood; L.A/C. H. G. Spry; L.A/C. F. J. West.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. P. H. Brown.

Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/CW. B. M Smith.

DIED ON ACTIVE SERVICE.—A/CW.2 E. Salmond.

Royal Australian Air Force

KILLED IN ACTION.—F/O. B. P. Cosgriff; Flt. Sgt. R. A. Dutneall; F/O. H. A. Jowett.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. L. T. Carter; P/O. A. T. S Collier; Flt. Sgt. N. J. Conway; Flt. Sgt. R. G Harris; Flt. Sgt. R. J. Hunter; P/O. B. L. Negus; Flt. Sgt. A. R. Single; F/O. C. G. White; Flt. Sgt. W. Yeomans.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. R. A. E. Lowe.

MISSING, BELIEVED KILLED IN ACTION.—W/O. A. H. J. Harris.

MISSING.—Flt. Sgt. P. W. Benson; P/O. D. P. Billman; F/O. K. C. Binnie; F/O. J. F. Bush; Flt. Lt. J. D. R. B. Carruthers; Flt. Sgt. E. G. Challis; Flt. Sgt. A. J. Downe; Act. F/O. A. R. Dyer; W/O. H. E. Gilmour; Flt. Sgt. A. D. Hartley; Flt. Sgt. A. E. Heap; Flt. Sgt. R. Howard; Act. F/O. D. B Jeffery; W/O. J. S. Le Maire; Flt. Sgt. J. A. W. McKinnon; Act. F/O. G. E. Maxwell; Flt. Sgt. S. Mills; Flt. Sgt. J. E. Osborne; F/O. G. J. Pursey; Flt. Sgt. T. L. Roberts; Flt. Sgt. F. L. Robertson; Flt. Sgt. M. K. G. Roy; Flt. Sgt. J. Sheen; P/O. L. A. Woodward.

KILLED ON ACTIVE SERVICE.—F/O. I. MacK. Angus; Flt. Sgt. N. L. Newbey; P/O. B. C. Roderick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. M. Lovelle Draper.

Royal Canadian Air Force

WOUNDED OR INJURED IN ACTION.—Flt. Lt. D. C. W. Stults.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. A. E. West.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. T. P. Jarvis; F/O. D. C. McLeod; Flt. Sgt. C. E. Towsley; Flt. Lt. F. W. Ward; Flt. Lt. J. F. H. Williams, D.F.C.

MISSING.—F/O. R. G. Askew; F/O. G. Bishop; Sgt. E. M. Bryant; Flt. Lt. R. R. Burgess; P/O. R. G. Carter; F/O. G. A. S. Cashion; Sgt. J. T. E. Chalk; W/O. E. G. Crawley; Flt. Sgt. R. Dey; F/O. J. I. Duguid; F/O. M. B. Dyer; Sgt. G. F. Finch; W/O. L. E. Findlay; Sgt. J. R. Giles; F/O. R. L. Green; Sgt. N. Gronbeck; P/O. C. B. Haaland; Flt. Lt. R. L. Harman; Flt. Sgt. A. J. Henderson; Flt. Sgt. G. A. Hodgkins; P/O. G. K. Huish; Flt. Lt. D. W. Johnson; Flt. Sgt. J. R. Kellum; W/O. R. A. Leach; F/O. D. T. Leavitt; W/O. F. W. Logan; Flt. Lt. W. N. McPherson; Sgt. G. B. Martin; F/O. O. H. Mennie; F/O. K. L. Moss; Sgt. J. L. Nelson; Flt. Sgt. G. O Olson; Flt. Sgt. J. Rheubottom; F/O. J. M. Roberts; Sgt. J. E. Scarson; F/O. R. J. Sheen; Sgt. J. P. Shortt; Sgt. J. Spevak; F/O. S. J. Sullivan; Flt. Lt. W. R. R. Sutton; Flt. Sgt. F. Vandroogenbroeck; W/O. J. J. R. Vannier; F/O. R. J. B. Warren; F/O. F. Wittmack; Flt. Lt. H. L. Wolf.

KILLED ON ACTIVE SERVICE.—F/O. J. J. D. Belanger; Flt. Sgt. A. P. Braniff; F/O. R. S. Bray; Flt. Lt. I. McK. Caldwell; P/O. R. L. Cuzner; Sgt. J. A. M Dauplaise; Sgt. J. M. O. Martin; Flt. Lt. W. J. Mattocks; Sgt. J. L. Moreau; F/O. C. D. Sibbett; L.A/C. C. G. Smith; Flt. Lt. M. C. Taylor; F/O. J. S Walsh.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. K T. Wolfenden.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt Sgt. L. S. Crawford-Watson; Flt. Sgt. G. B. Imrie; Flt. Sgt. C. James; P/O. W. S. Masters.

MISSING, BELIEVED KILLED IN ACTION.—P/O. I. E. Blance; Flt. Sgt. F. W. Climo; F/O. B. R. J. Hay, D.F.C.

MISSING.—F/O. H. Callow; Flt. Sgt. L. C. Hickford; P/O. E. Howell; Flt. Sgt. F. F. A. Jenkins; Flt. Sgt. G. H. Redwood; Flt. Sgt. G. B. Roche; Flt. Sgt. K. E. Smith.

South African Air Force

MISSING.—Lt. A. E. Goodman; Lt. E. Williams.

KILLED ON ACTIVE SERVICE.—Lt. F. M. Du-Toit.

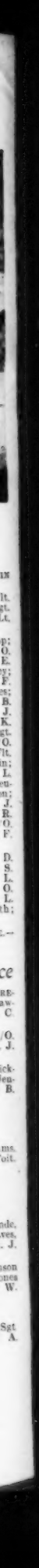
Fleet Air Arm ground crews salvaging a Fairey Barracuda from a swamped paddy field in the tropics.

Official Corrections

Casualty Communiqué No. 440.

Under "MISSING" delete Sgt. R. A. Conde, P/O. J. Docherty, Flt. Sgt. J. W. Hargreaves, Flt. Lt. F. D. Rumble, Sgt. E. Turner and Sgt. J. Warrinton.

For W/O. J. Dickinson read P/O. J. Dickinson For Sgt. R. E. Jones read Flt. Sgt. R. E. Jones R.C.A.F.—Under "MISSING," for Sgt W. W. Rennie read Flt. Sgt. W. W. Rennie.

Casualty Communiqué No. 441.

Under "MISSING," delete F/O. G. W. Cash, Sgt J. W. Perkins, F/O. E. W. Ruston, Sgt. P. A. Tarlton, Sgt. W. L. Thompson.